UNIVERSAL

CONCRETE BUILDING ACCESSORIES

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UNIVERSAL

Used by the Nation's UNI-FORM TRADE MARK *Construction Engineers*

CONCRETE BUILDING ACCESSORIES

Catalog No. 200

UNIVERSAL FORM CLAMP CO.

GEO. BENDIXEN
Eastern Representative
51 EAST 42nd STREET
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IN CONSIDERING the wonderful progress of the building industry during the last quarter of a century, even the most casual observer can appreciate the important part that concrete construction has played and is now playing.

Any device that tends to save costs or simplify processes in concrete construction, even though little on each job, is effecting enormous savings in the industry when considered as a whole. The application of these devices to his job is deserving of careful thought by every contractor.

The savings effected by Universal Form Clamps, Adjustable Shores and concrete accessories are appreciable ones even in individual instances. In proof of this fact you will find Universal Equipment consistently used on the biggest jobs by the biggest contractors. Some contractors have reported a saving of 50%.

The following pages are worth looking into.

C O N T E N T S

For Forms and Centering

Rod Clamps
Malleable Washers
Tightening Wrenches
Rod Pullers
Cone Nuts (Couplings)
Rod Couplings (Hexagonal)
Adjustable Shores
Complete Tee and L Heads
Post Caps
Band Clamps
Wire Clamps
Soffit Spacers
Symons Column Clamps

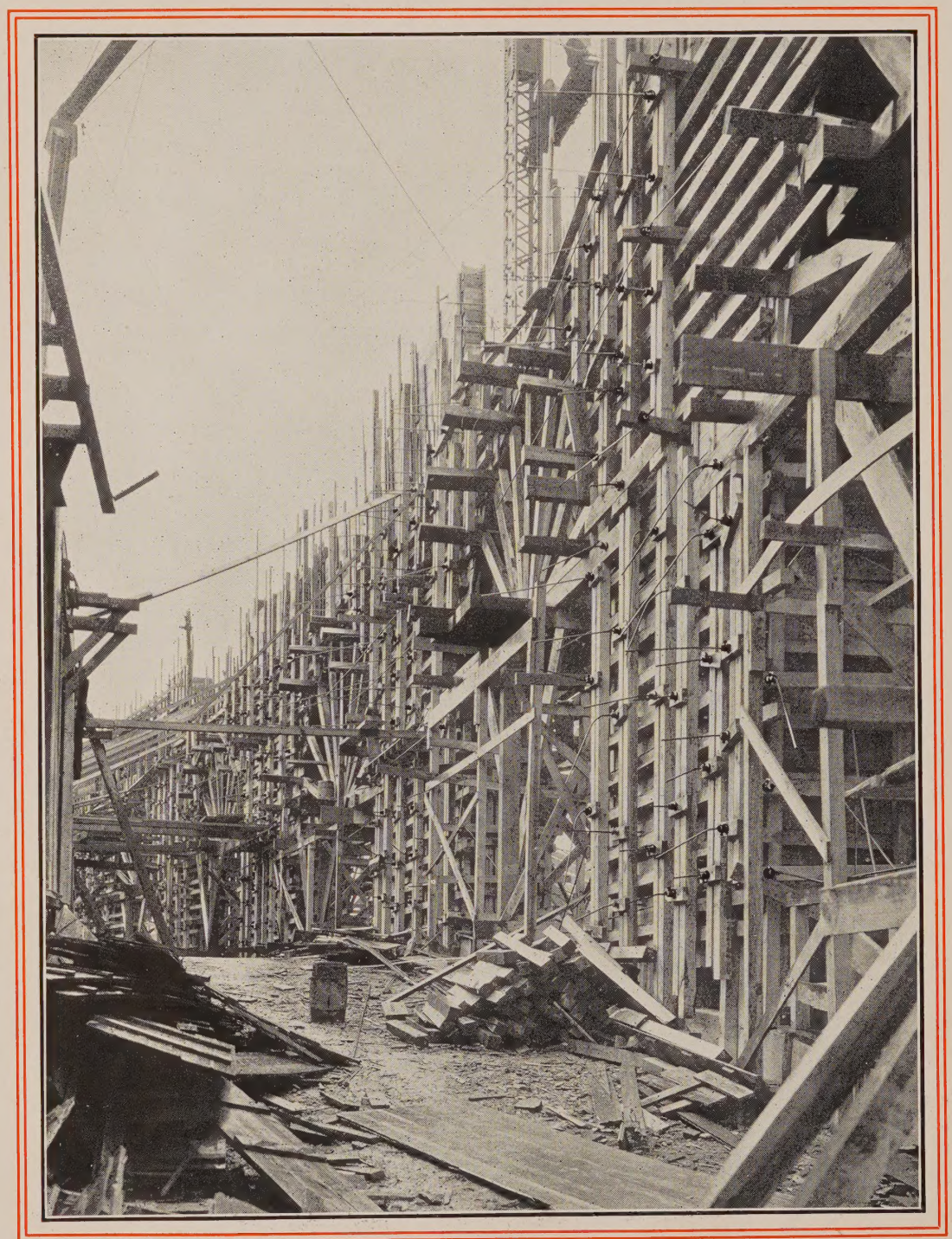
For Reinforcing Steel

Slab Bar Spacers
Beam Bar Spacers
Beam Bar Bolsters
Joist Bar Spacers
High Chairs
Bar Chairs
Bar Ties
Tie Chairs

• • •

Screed Chairs
Continuous Sleeper Anchors
Pressed Steel Inserts
Malleable Inserts
Beam Wrapping

UNI-FORM
TRADE MARK



These arches and columns in this colonnade of a large stadium required very complicated forms. The work was greatly simplified by using Universal Form Clamps.

Form Clamps Adjustable Shores *and* Bar Spacers

Universal Form Clamps

Patented Sept. 1, 1914; Feb. 15, 1916; Aug. 13, 1918.

THE work of tying and hanging forms for concrete is greatly simplified with Universal Form Clamps. They can be used under any conditions and are adaptable to any design of form for walls and columns. These clamps are stocked in five sizes, to take rods from ¼″ to ¾″ in diameter.

On any column of any height, any pier wall or abutment of any size, in hanging soffits, in suspending centering from structural steel, Universal Form Clamps insure accurate forms. They absolutely prevent spreading and thereby save many extra yards of concrete.

A single unit, exceedingly simple in principle and application.

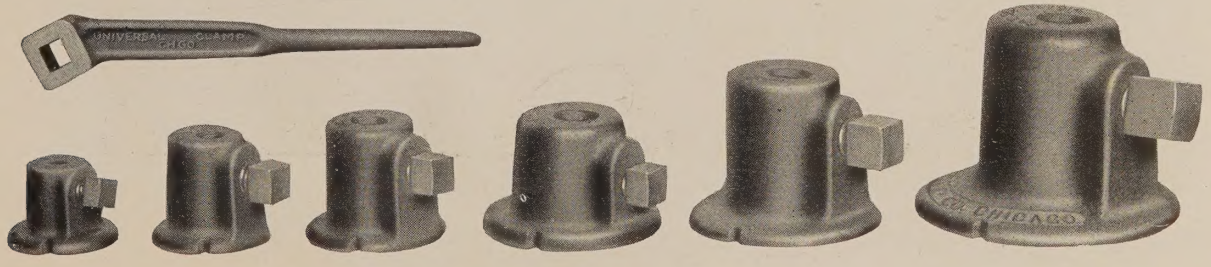
The real economy of the Universal Form Clamp lies in its simplicity and adaptability. These features account for its presence on many of the largest jobs throughout the country. It is very simple in design and very easily fastened in place. Plain round mild steel rods take the place of threaded rods with nuts and washers, or of twisted wire. To apply, the clamp is slipped over the rod, brought to bear against the form and the set screw tightened. The form is moved into line with a Universal Tightening Wrench.

The absence of exposed threaded parts in the clamp itself and the fact that no special threaded rods are required in their use will be appreciated by the man who has had experience with concrete hardening in threaded equipment.

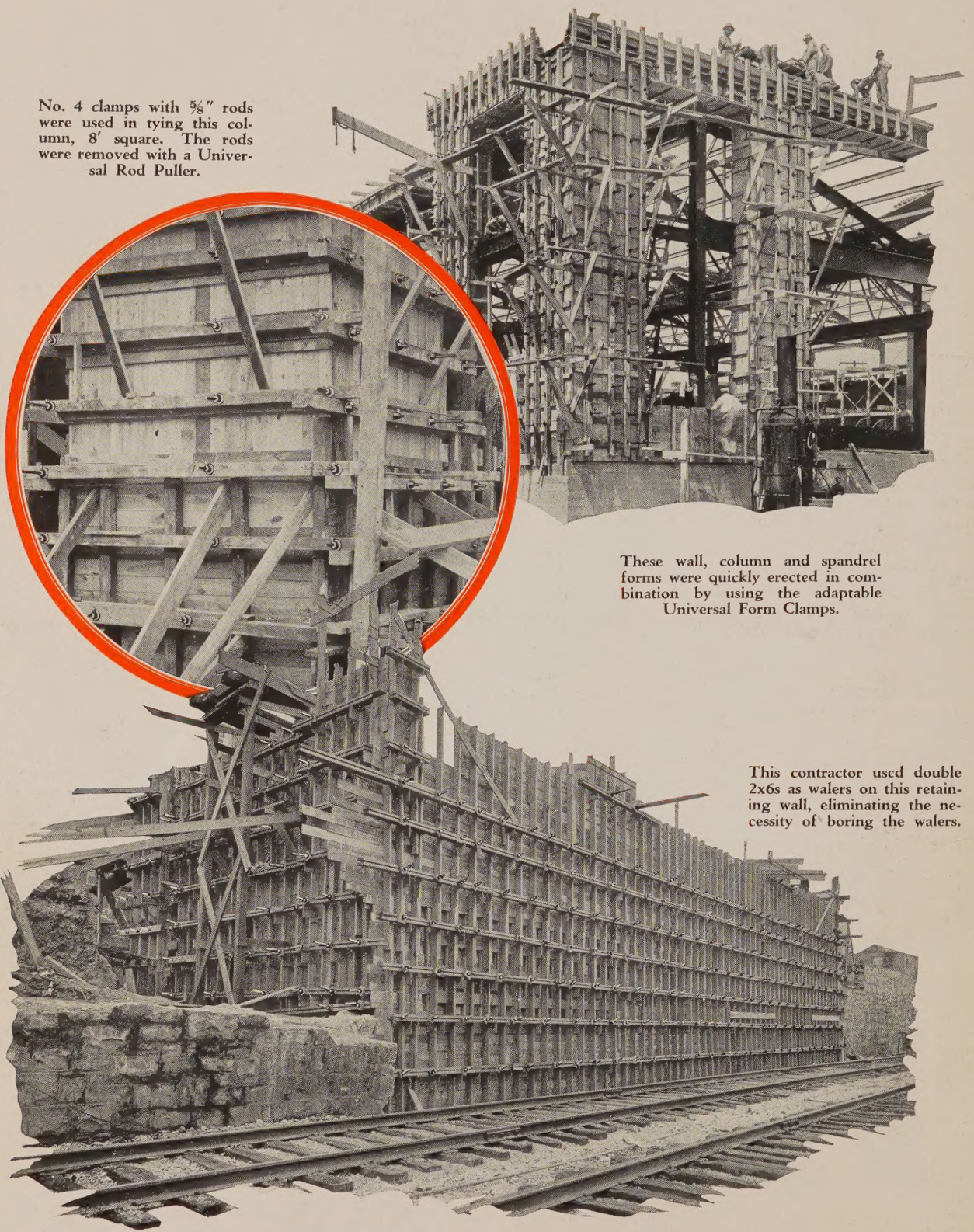
On tapered or battered retaining walls, Universal Form Clamps save the time necessary to plot the various lengths of tie rods as is necessary when threaded rods are used. On a job of this kind, where every rod is of a different length, the Universal Form Clamp has an adjustment equal to the length of rod exposed outside of the forms.

The time-saving qualities of Universal Form Clamps reduce the costs of tying forms to a minimum, and they save time and material when the forms are being knocked down. When they are used with panel forms, the forms can be quickly and easily removed without damaging the panels.

These clamps are equipment in the truest sense of the word. They are adjustable to all jobs and can be used again and again. As a concrete mixer is used on every job regardless of design or construction, so Universal Form Clamps can be applied economically to all concrete work.

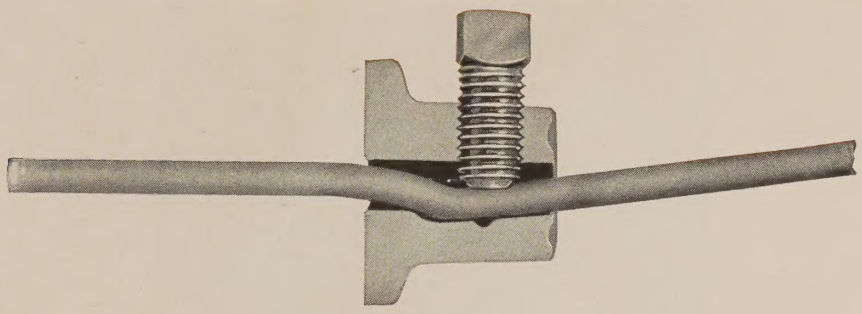


No. 4 clamps with 5/8" rods were used in tying this column, 8' square. The rods were removed with a Universal Rod Puller.



These wall, column and spandrel forms were quickly erected in combination by using the adaptable Universal Form Clamps.

This contractor used double 2x6s as walers on this retaining wall, eliminating the necessity of boring the walers.



The Sure Grip Principle

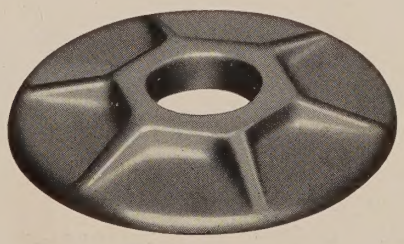
THE above cross-section shows the simplicity of the Universal Form Clamp. It is a simple patented casting with a flanged bearing surface, an oval hole with shoulders at the small side of opening through which a plain bar is passed. There is a set screw threaded into the large side of the opening and perpendicular to the same, to engage the rod intermediate of the shoulders, so as to depress the rod between the shoulders. The depression of the rod between the shoulders insures the clamp against slipping or moving on the rod. The set screw does not carry the load. It merely holds the rod in the depression, throwing the load on the shoulders of the clamp.

Repeated tests have shown that Universal Form Clamps will hold past the breaking point of 1/4", 3/8" and 1/2" round rods. The 5/8" clamps will take a load of five tons before slipping.

One man can tie up forms with Universal Form Clamps. He simply slips the clamp over the end of the tie rod, jacks the form in line with the Universal Tightener and tightens the clamp in the desired position by turning the set screw. The small wrench shown on page 5 is used for tightening set screws in the clamps. It will be furnished only when specified.

See page 25 for sizes, weights and safe loads.

The Malleable Washer



INSTEAD of boring holes for tie rods, many contractors save that time and labor by using double 2x4s or 2x6s for walers. The tie rods can then be slipped through the walers at any point —saving the time of measuring, spacing and boring the holes. This Malleable Washer is used with the Form Clamp on such a layout. It gives full bearing on both members of the waler, serving to hold the waler in place as well as insuring a tight clamp and accurate form. The washer is of malleable iron designed to stand as great a load as the clamp itself. They are stocked in sizes from 1/2" to 1" for 3/8" to 3/4" rods.

The Universal Tightener is slipped on the rod after the form clamp, the cam is set, and the form lined up by simply turning the handle of the tightener.

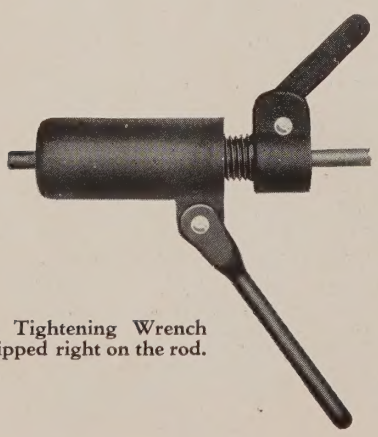
The Tightening Wrench

Patented Oct. 10, 1911; Sept. 1, 1914; Aug. 13, 1918.

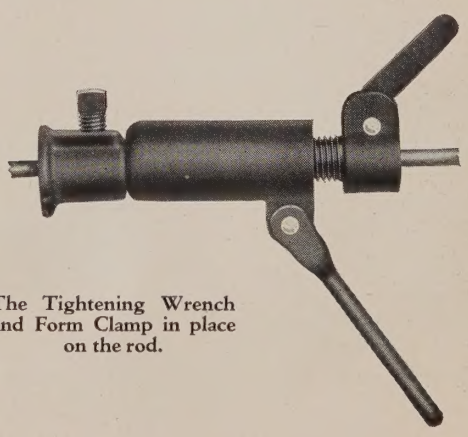
THE TIGHTENING WRENCH is a device used in conjunction with the Universal Form Clamp to exert a pressure against the form to draw it in line, or to desired dimensions. It is placed over the rod after the clamp is on. The tightener is made of four parts—namely, the nut which bears against the clamp, the hollow screw through which the rod passes, a cam and a handle.

The cam is of hardened tool steel and is used for locking the hollow screw to the rod. The slightest pressure against the nut when the cam engages the rod will lock the screw on the rod. For drawing the form together, it is necessary only to turn the handle and unscrew the nut from the screw, the same as with an ordinary jackscrew. When the form is in position, the set screw in the clamp is tightened. Before the tightener is removed, the handle is given a couple of turns backward to relieve the pressure on the cam, after which the tightener is free to remove.

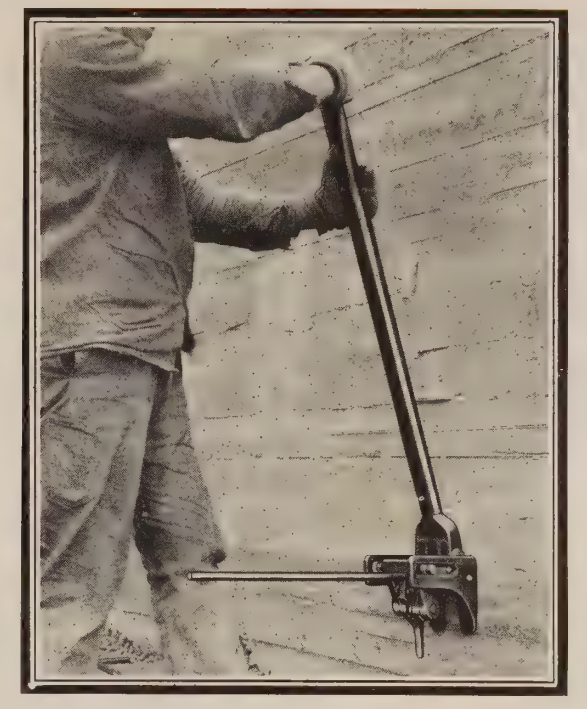
See page 26 for sizes of Tighteners and Repair Part List.



The Tightening Wrench is slipped right on the rod.



The Tightening Wrench and Form Clamp in place on the rod.



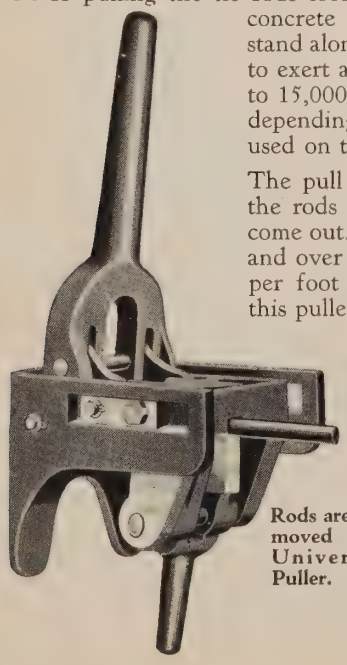
A length of pipe used on the handle of the Universal Rod Puller enables a man to exert from 10,000 to 15,000 pounds pull on the rod. The rods are not bent when they come out.

The Rod Puller

Patented March 27, 1917.

THE ROD PULLER is for the purpose of removing or pulling the tie rods from the concrete after the concrete has set sufficiently to stand alone. The puller is designed to exert a pressure of from 10,000 to 15,000 pounds pull on the rod, depending on the length of pipe used on the handle.

The pull is in a straight line and the rods are not bent when they come out. They can be used over and over again, and the labor cost per foot of removing them with this puller is far less than the cost per foot of new rod. The parts of the puller are all of the highest grade steel castings that can be obtained.



Rods are quickly removed with this Universal Rod Puller.

Rods should be pulled not later than from sixteen to twenty-four hours after pouring the concrete in summer weather where the temperature ranges from 60° up. In winter weather rods can be left in the concrete four or five days. It is almost impossible to lay down a fixed rule as to the exact time of removing the rods. This can be determined very readily by a few trials. **See page 26 when ordering rod pullers and repair parts.**

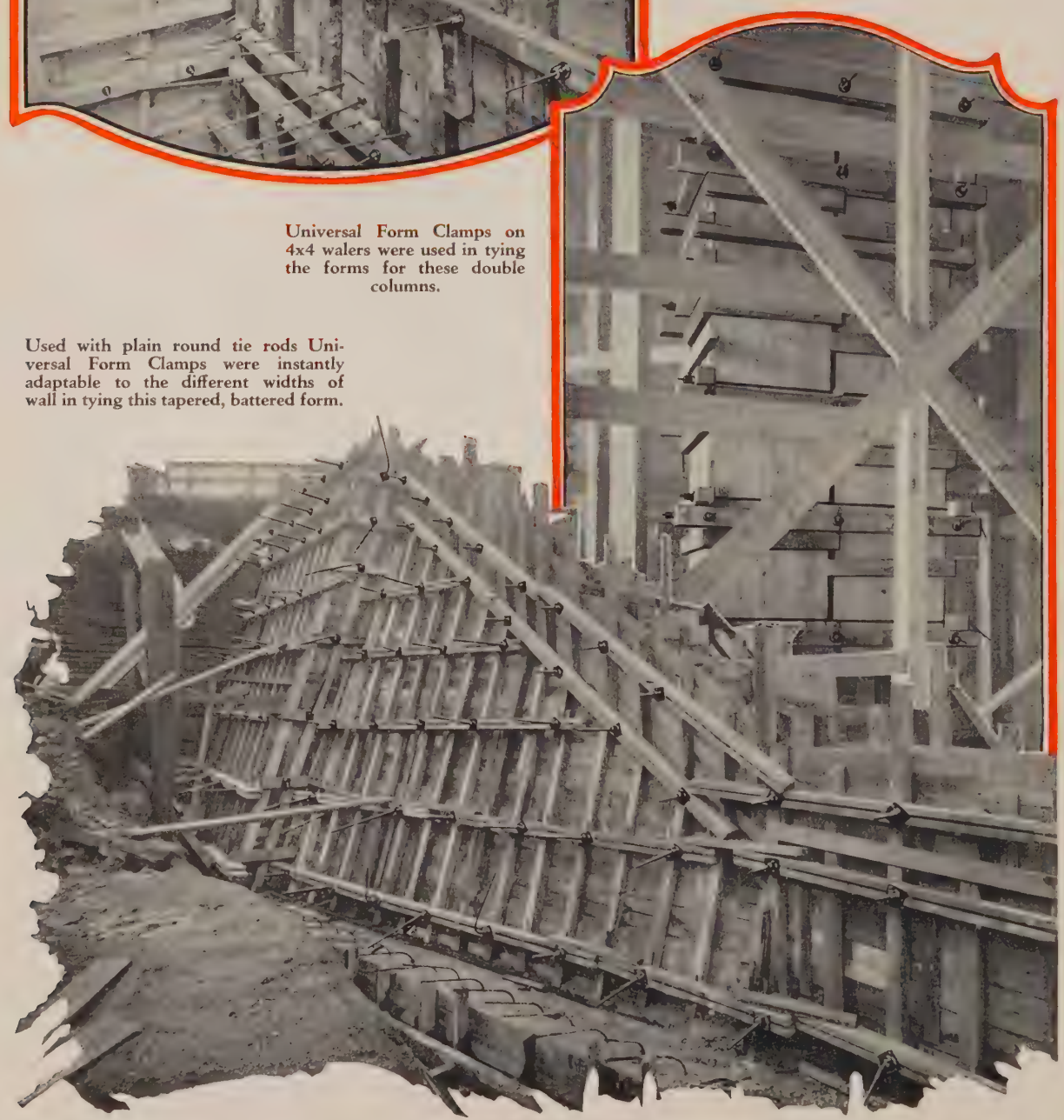
Paper Tubing

When tie rods are to be allowed to remain in the wall for any length of time before pulling, the use of Universal Paper Tubing provides for their easy removal. Its use is also recommended on all walls over 10 feet thick. This tubing, furnished in 5-foot lengths, is made of heavy waxed pasteboard—the ends are easily removed when grouting. It is low in cost and greatly simplifies the removal of rods wherever used.

These heavy foundation forms were tied with Universal Form Clamps.

Universal Form Clamps on 4x4 walers were used in tying the forms for these double columns.

Used with plain round tie rods Universal Form Clamps were instantly adaptable to the different widths of wall in tying this tapered, battered form.



Design of Wall Form

THE accompanying tables for wall forms have been computed for a fluid pressure of 140 lbs. per cu. ft. From 30 to 75 minutes after the concrete is poured it begins to stiffen up so that there is no increase in pressure if more concrete is poured above it. This time which is required for the concrete to stiffen depends on the wetness of the mix and the temperature, being greater for very wet concrete and cold temperatures. For the consistency of concrete ordinarily used and for summer temperature, this time may safely be assumed to be 45 minutes.

In the case of long walls it will not be necessary to fill the forms up rapidly and the height poured within 45-minute periods can be limited to a few feet. In that way the construction of the forms can be greatly cheapened, as they will not have to be made strong enough to hold the full height of wet concrete.

In the case of short walls or piers, it may be more economical to build the forms so that concrete can be poured more rapidly.

Example: No. 1

It is required to design the forms for a wall 2 feet thick and 20 feet high so that the forms can be filled at the rate of 6 feet in 45 minutes (or 8 feet per hour).

The design of the forms is independent of the thickness of the wall, because for a given height the pressure is the same for a thick wall as it is for a thin wall.

Thickness of Sheathing: For ordinary cases ¾″ sheathing will be most economical. The thickness of sheathing is shown on the table on page 12 by the zigzag lines. The ¾″ sheathing can be used for depths down to the top zigzag line. Below that line 1¼″ sheathing is required and below the bottom zigzag line the pressure requires 1⅝″ sheathing.

Spacing of Studs: Using the ¾″ sheathing at a depth of 6 feet, the table shows that the studs can be spaced 14 inches on centers. The stud spacing depends on the strength of the sheathing and not on the size of the studs.

Spacing of Walers: As shown in the tables, the spacing of the walers depends on the size and spacing of the studs.

If 2x4″ studs at 14-inch centers are used, the waler spacing from the top down is given as 6″, 41″ and 26″. The 6-foot depth comes near the bottom of the 26″ space so that spacing should be continued down the wall to the bottom.

If 2x6″ studs are used, the spacing is 6″, 55″ and 32″. The 6-foot depth comes above the center of the 32″ spacing so the next spacing above can be used. With the 2x6″ studs, the spacing can therefore be 55″ for the full depth and with a waler 6″ from the top and one at the bottom, the spacing between would work out to five spaces at about 3′ 11″, requiring in all six lines of waling.

Spacing of Bolts: The spacing of bolts in the walers depends on the size and spacing of the walers and the depth of concrete which is poured above the waler inside of a 45-minute period.

Separate diagrams are given on page 13 for ⅜″, ½″, ⅝″ and ¾″ bolts in 2x4″ and 2x6″ walers so that any desired size of bolt may be used.

In using the diagram for bolt spacing at the top waler the waler spacing is to be taken as the distance from the top waler to the next waler below. For all other walers the waler spacing should be taken as the average of the spaces next above and below the waler in question. The depth of waler should be taken as the distance from the top of the concrete down to the waler, but need never exceed the depth to which concrete will be poured within 45 minutes.

Then assuming the walers to be double 2x6s and spaced as determined for the 2x6″ studs, the spacing to be used for the top waler is 3′ 11″, or 47″. Enter the diagram for 2x6″ walers and ⅝″ bolts at the left-hand side with the waler spacing of 47″. Follow the horizontal line over the curve marked "Depth of waler 6 inches" and then vertically down to the scale at the bottom where the bolt spacing is found to be 75″ for the top waler.

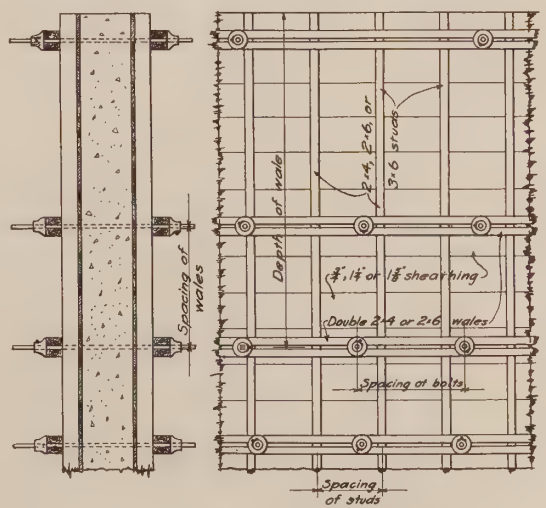


DIAGRAM OF WALL FORMS

For the second waler the waler spacing to be used is equal to the average of the spacings next above and below, or 47″, and the depth of waler is 4′ 5″ below the top of the concrete. Enter the diagram as before at the left-hand side at 47″ and follow horizontally to a depth of waler of 4′ 5″ (5/12 of the distance from the 4-foot curve to the 5-foot curve). Then follow vertically to the scale at the bottom, where it is found that the ⅝″ bolts should be spaced about 24½″ apart. Since the height of concrete to be poured is limited to 6 feet, the same bolt spacing can be used for all walers below the second.

Example: No. 2

Suppose that the wall in the preceding example is short and the concrete is to be placed at the rate of 12 feet in 45 minutes (16 feet per hour).

Thickness of Sheathing and Spacing of Studs: The pressure of the concrete at a depth of 12 feet will require studs to be spaced 10″ for the ¾″ sheathing, or 18″ for the 1¼″ sheathing. It should also be noticed that for 2x6″ studs the waler spacing at 12-foot depth is 24″ with 10″ stud spacing and 15″ with the 18″ stud spacing. In important cases two or more complete designs should be made and their cost estimated so that the most economical can be determined.

In the present example the ¾″ sheathing and 2x6″ studs spaced 10″ will be used.

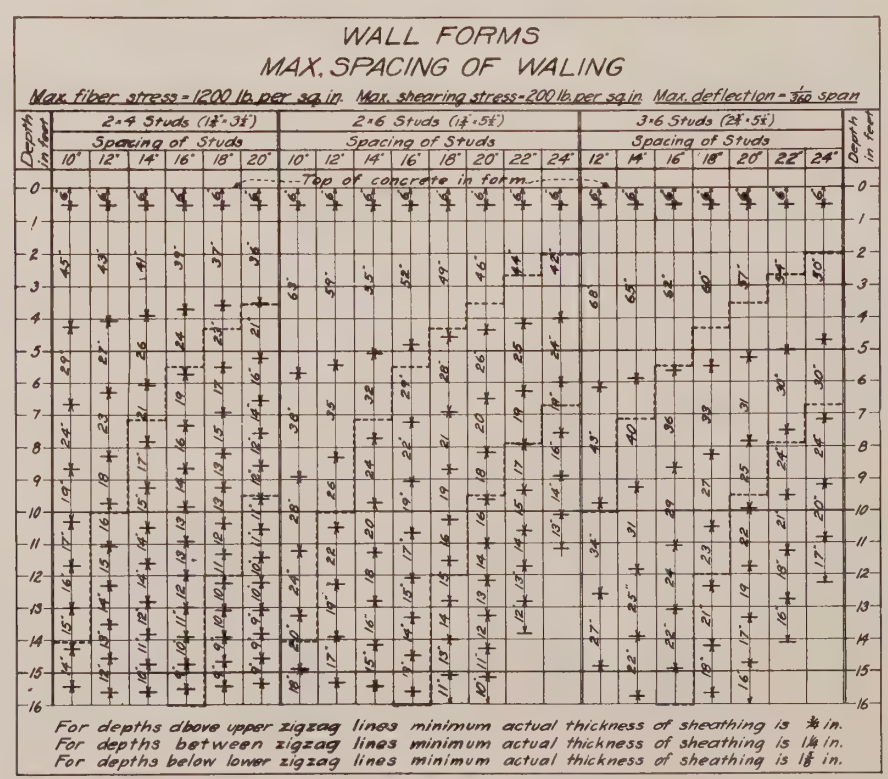
Spacing of Walers: For the 2x6″ studs spaced 10″ the table gives the spacing of walers as 6″, 63″, 38″, 28″, 24″.

Spacing of Bolts: Using double 2x6″ walers and ⅝″ bolts, the bolt spacing should be found as in the previous example. The values for the different walers are given in the following table:

No. of Waler—	1	2	3	4	5, 6, etc.
Waler Spacing	63″	50½″	33″	26″	Same as 4th
Depth	6″	5′ 9″	8′ 11″	11′ 3″	
Bolt Spacing (from diagram)	57″	17½″	17½″	17½″	

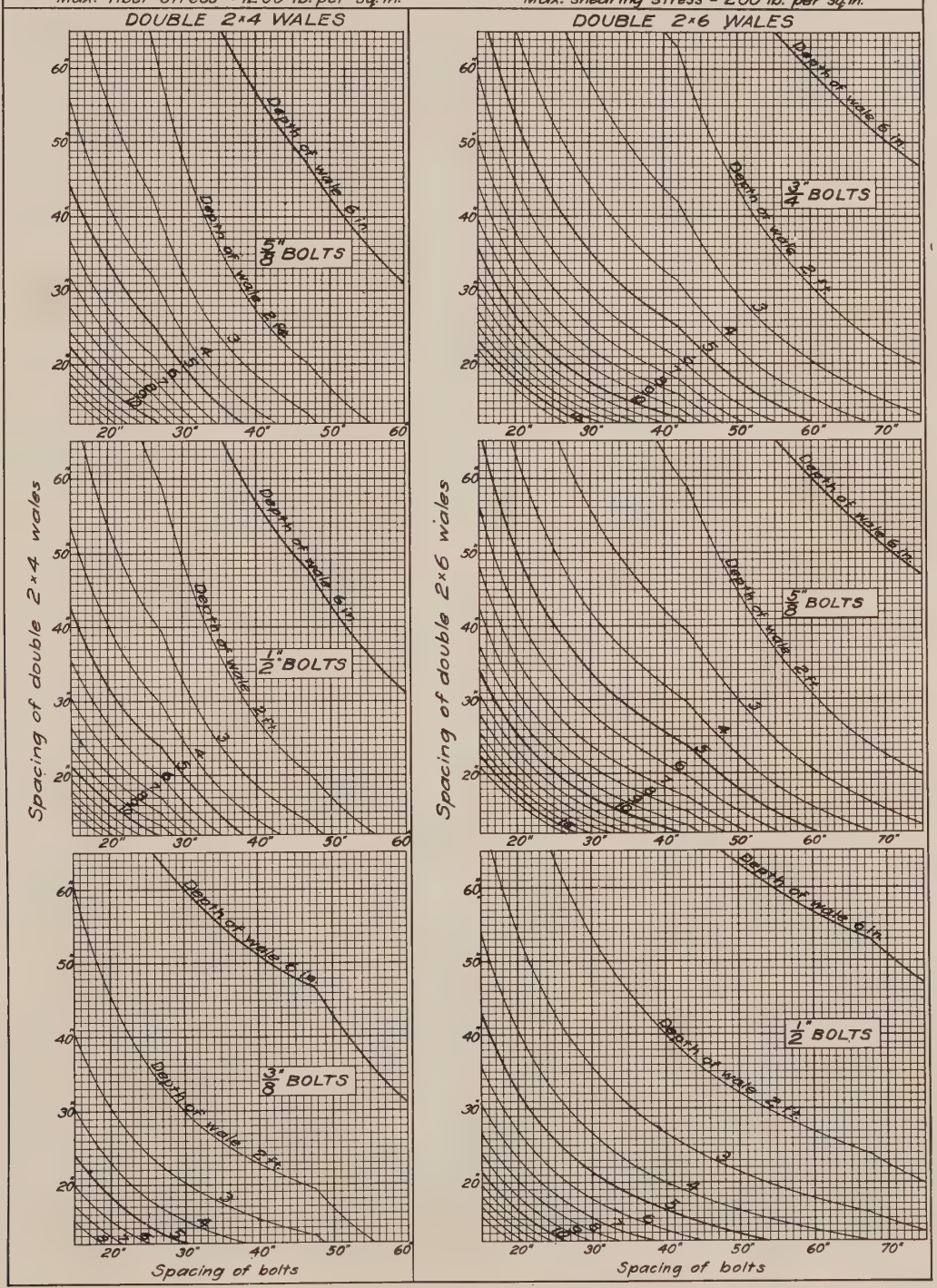
Below the fourth waler the spacing of walers can be 24″ down to the bottom.

The cut, on page 11, shows the various members of the form construction referred to above. All tables and diagrams shown in our catalogue should be of great value to the contractor, both in the estimating and constructing of a job.


WALL FORMS
MAX. SPACING OF WALING
Max. fiber stress = 1200 lb. per sq. in. Max. shearing stress = 200 lb. per sq. in. Max. deflection = 1/360 span
2×4 Studs (1⅝″×3⅝″)
2×6 Studs (1⅝″×5⅝″)
3×6 Studs (2⅝″×5⅝″)
Spacing of Studs
Depth in feet
Top of concrete in form
For depths above upper zigzag lines minimum actual thickness of sheathing is ¾ in.
For depths between zigzag lines minimum actual thickness of sheathing is 1¼ in.
For depths below lower zigzag lines minimum actual thickness of sheathing is 1⅝ in.

WALL FORMS
MAX. SPACING OF BOLTS

Max. tension in bolts = 16 000 lb. per sq. in. on gross section
Max. deflection of waling = $\frac{1}{360}$ of span
Max. fiber stress = 1200 lb. per sq. in. Max. shearing stress = 200 lb. per sq. in.



The riser forms of this large grandstand for a Chicago ball park were tied with Universal Form Clamps.

These riser forms were tied by using Universal Clamps with a 5/16" rod having a 2½" wood-screw on one end, thereby eliminating all work behind and beneath the forms.

Universal Form Clamps on Riser Forms

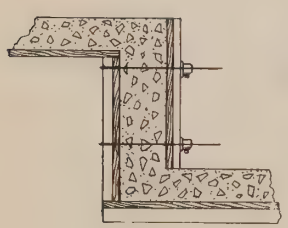
UNIVERSAL FORM CLAMPS afford a most economical means of tying riser forms in stadium, grandstand and theatre balcony construction. The two methods outlined are equally practical. Method A, illustrated below, eliminates all work underneath and behind the forms.

With the No. 1 Universal Form Clamp, a 5/16″ rod with a 2½″ wood screw on one end is furnished. This rod acts as a lag screw and goes through the front form and into the rear form of the riser. Holes for this rod should be drilled with electric equipment. A Universal Form Clamp is slipped over the outside end of the rod and the front form drawn into line with a Universal Tightener. One line of rods is sufficient for shallow risers. If the risers are deep, the rods should be staggered high and low to prevent tilting.

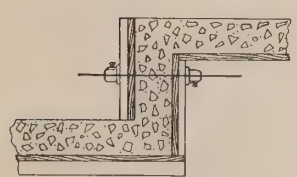
Rods may be removed with the same tool (brace or an electric drill) with which they were inserted, or by bending the rod at right angles outside the form, to make a handle with which to twist out the rod.

Method B, shown below, makes use of a plain ¼″ or 5/16″ rod and two No. 1 Universal Form Clamps. Holes are bored through the front and rear riser forms, and the rod with the clamp already fastened on one end inserted from the back. The clamp is then slipped over the front end of the rod and the form drawn into line as before. The rod is easily removed with a No. 1 Universal Rod Puller.

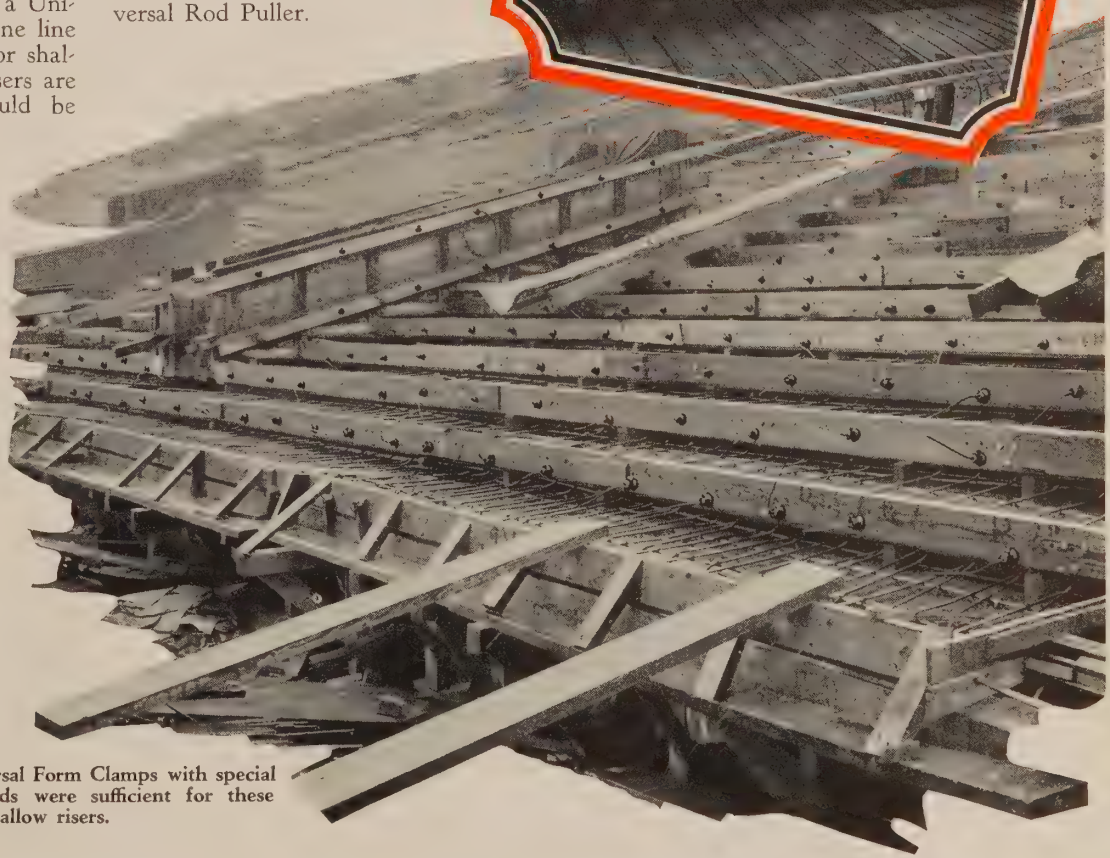
View of riser form before the front wall is in place. It will be quickly fastened by Universal Form Clamps used with tie rods having a screw end.



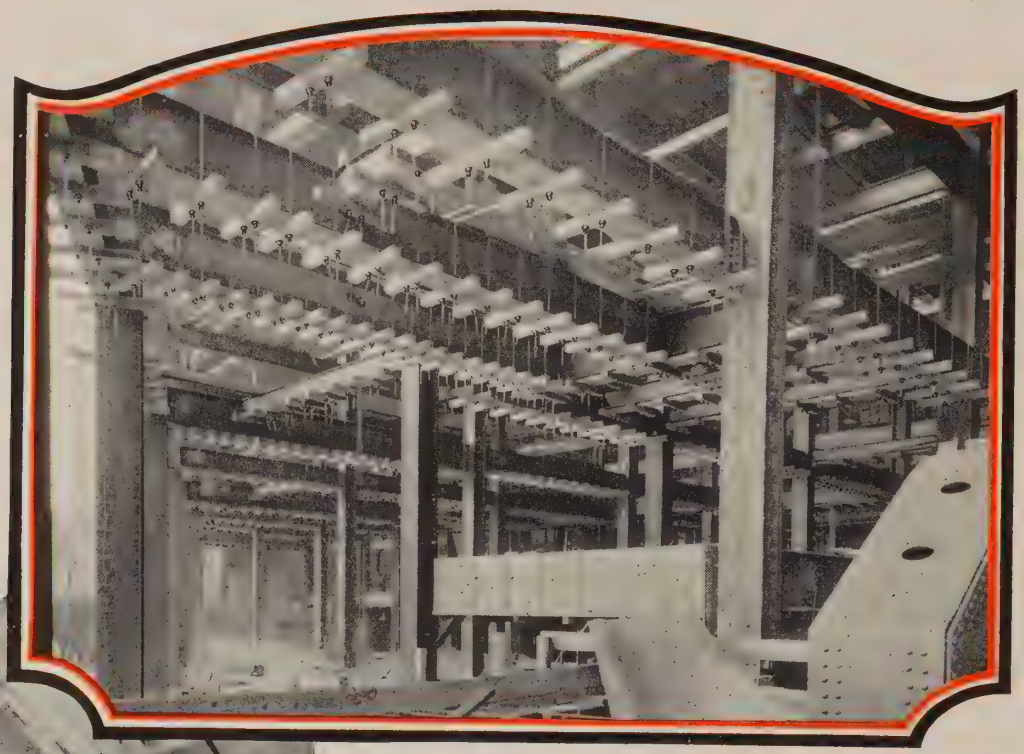
Method A



Method B



One row of Universal Form Clamps with special wood screw tie rods were sufficient for these shallow risers.



Universal Form Clamps saved the time and material of shoring on this work. Fifty-three thousand were used.

Tile soffits do not interfere with the hanging of centering for concrete floors.

Hanging Forms from

HANGING forms with the Universal Form Clamp is the simplest and quickest method known. The sectional drawings on pages 18 and 19 show their application on two general types of design, one with steel pans or tile and the other with solid slabs.

No. 1 or No. 2 Clamps with ¼″ or ⅜″ rods are generally used, the rods being bent to form U-shaped stirrups, and placed over the "I" beams with their ends down. The spacing varies from 16″ to 36″, depending on the load. The soffit board is then raised to position with the ends of the stirrups passing through holes in the soffit, and through 4x4″ or double 2x4″ cleats. Universal Form Clamps are then fastened under these cleats on the loose ends of the stirrups, and the soffit is drawn up to position by a Universal Tightener. Soffit spacers, very

An example of suspended forms for fireproofing heavy girders.

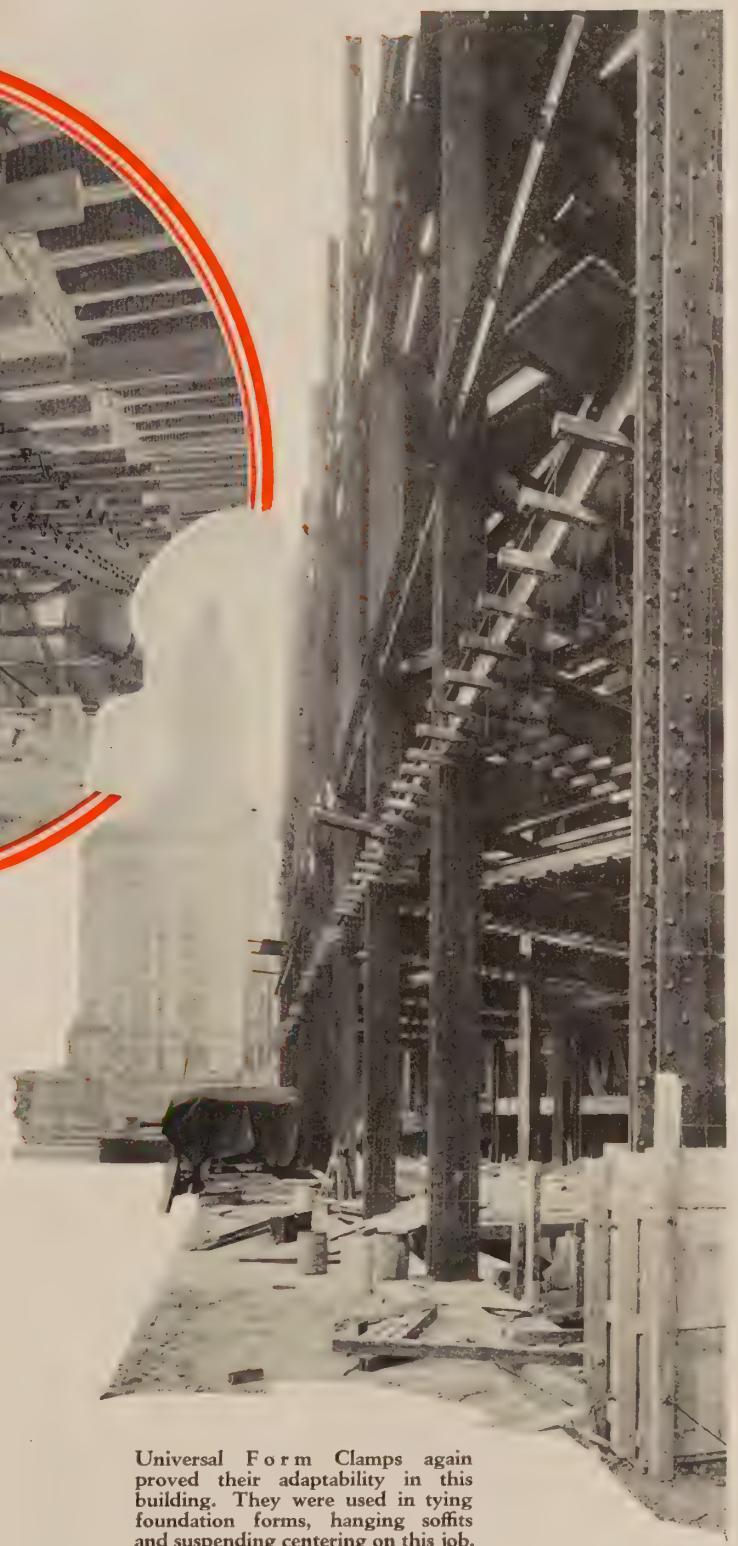
Structural Steel

inexpensive, are furnished to space the soffit board the proper distance from the "I" beam. The centering for the floor is then built up and suspended from the soffit and cleats.

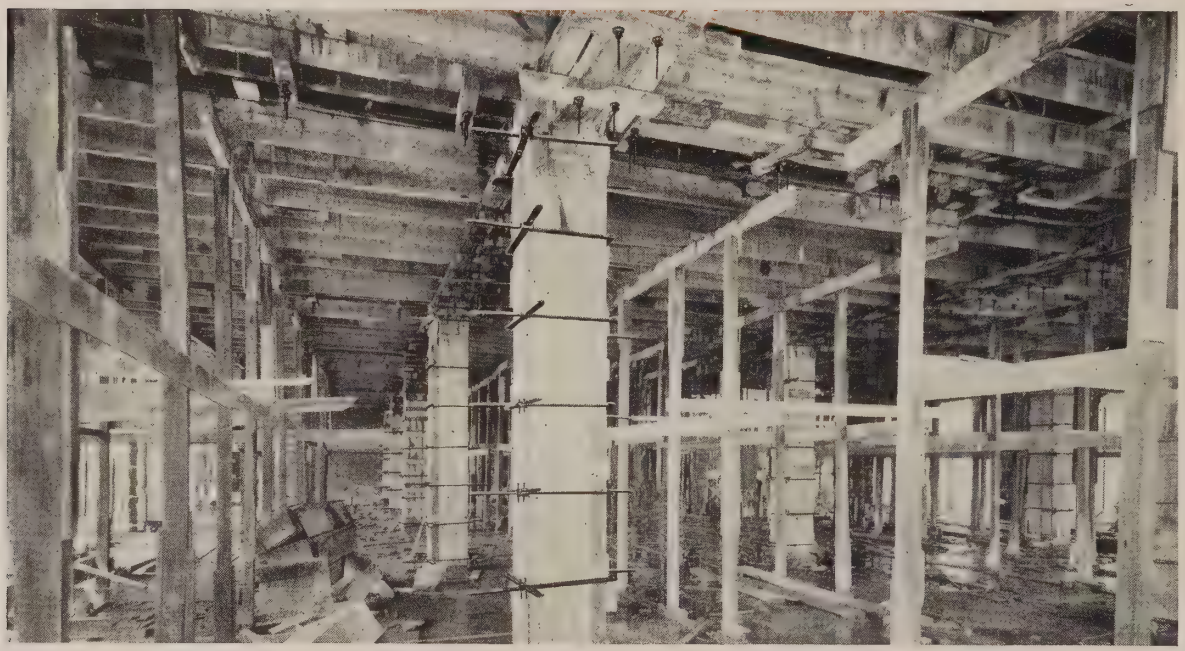
After the forms are removed, the stirrups can be used as hangers for suspended ceilings or can be cut off practically flush with the concrete by means of a bolt cutter.

The lumber and the piecing, wedging and bracing of shoring are eliminated—the floors are kept clear for speedy and uninterrupted work. The savings are plainly evident, and the fact that the biggest contractors are using this method wherever possible speaks for its practicability.

There is no other method in any way comparable to that outlined above, to the best of our knowledge.



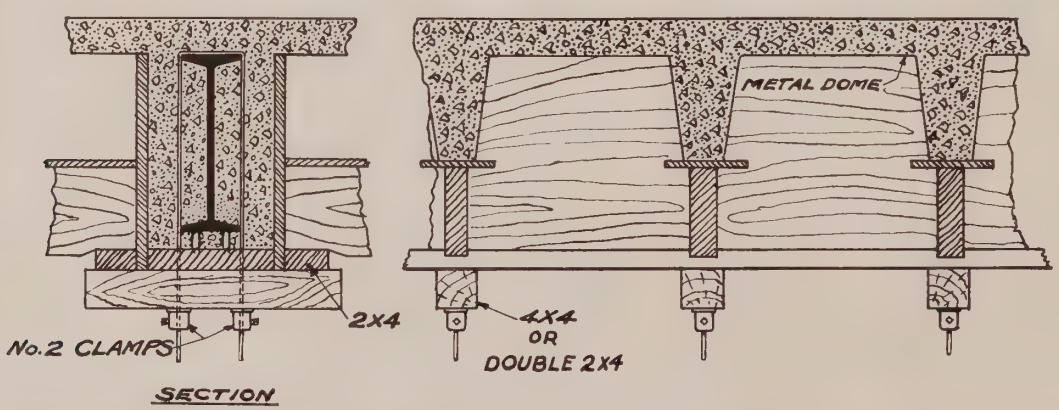
Universal Form Clamps again proved their adaptability in this building. They were used in tying foundation forms, hanging soffits and suspending centering on this job.

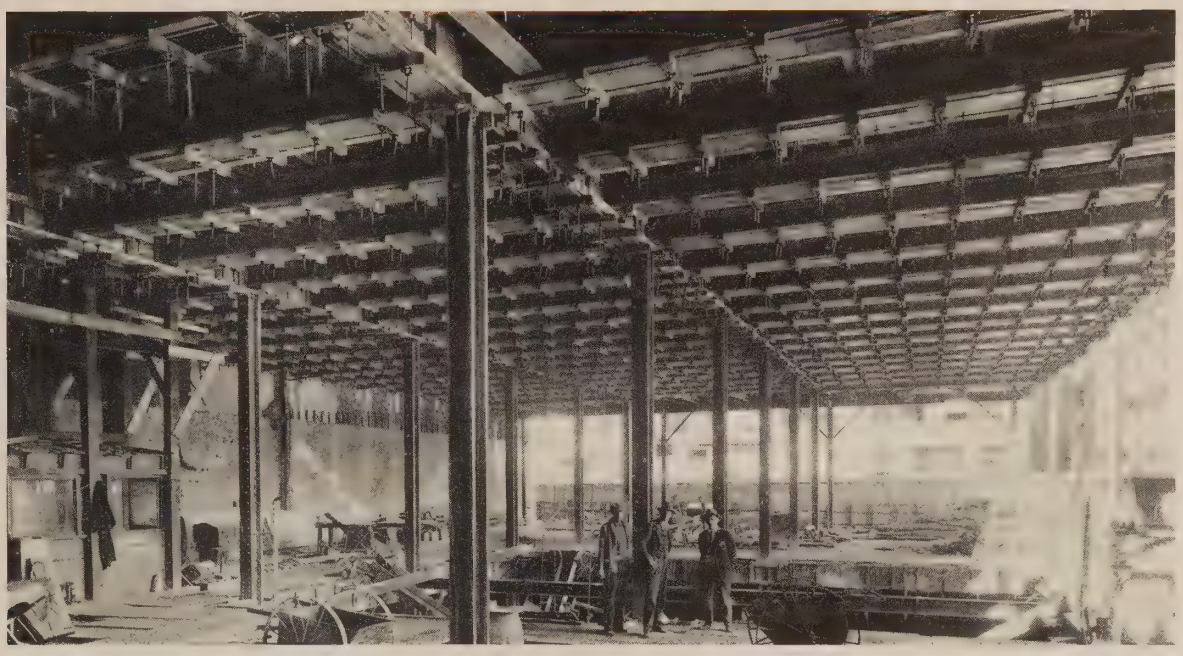


All forms in this 14-story building were hung with Universal Form Clamps. The centering was built up for metal dome construction as shown in section below.

Hanging Forms with Steel Pan Construction

THE sketch below is typical for forms in buildings of concrete joist construction, and is applicable with either metal domes or clay tile. Long spans are the rule in this type of design, and in order to save on both the quantity of clamps and the size of the wood joists, it is economical to run one or two rows of shores through each panel. The construction is so simple that it seems unnecessary to give a detailed description of it. The upper photograph shows this design, the centering being built up for metal dome construction. This building is fourteen stories high and of considerable floor area. Every form was so hung.

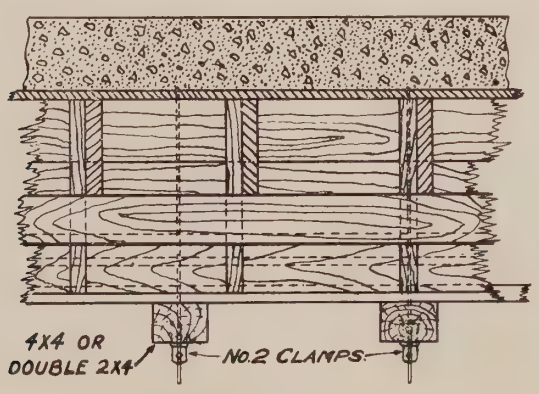


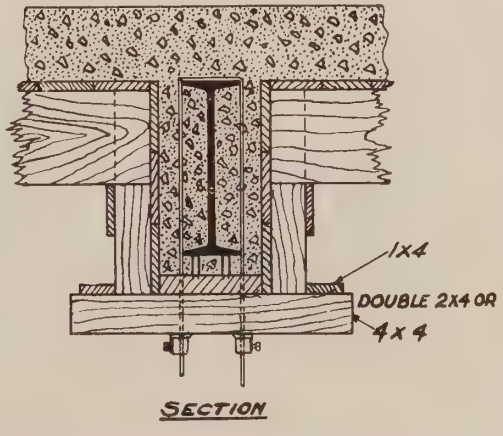


The forms in this building were hung with Universal Form Clamps. Centering was built up for slab construction as shown below.

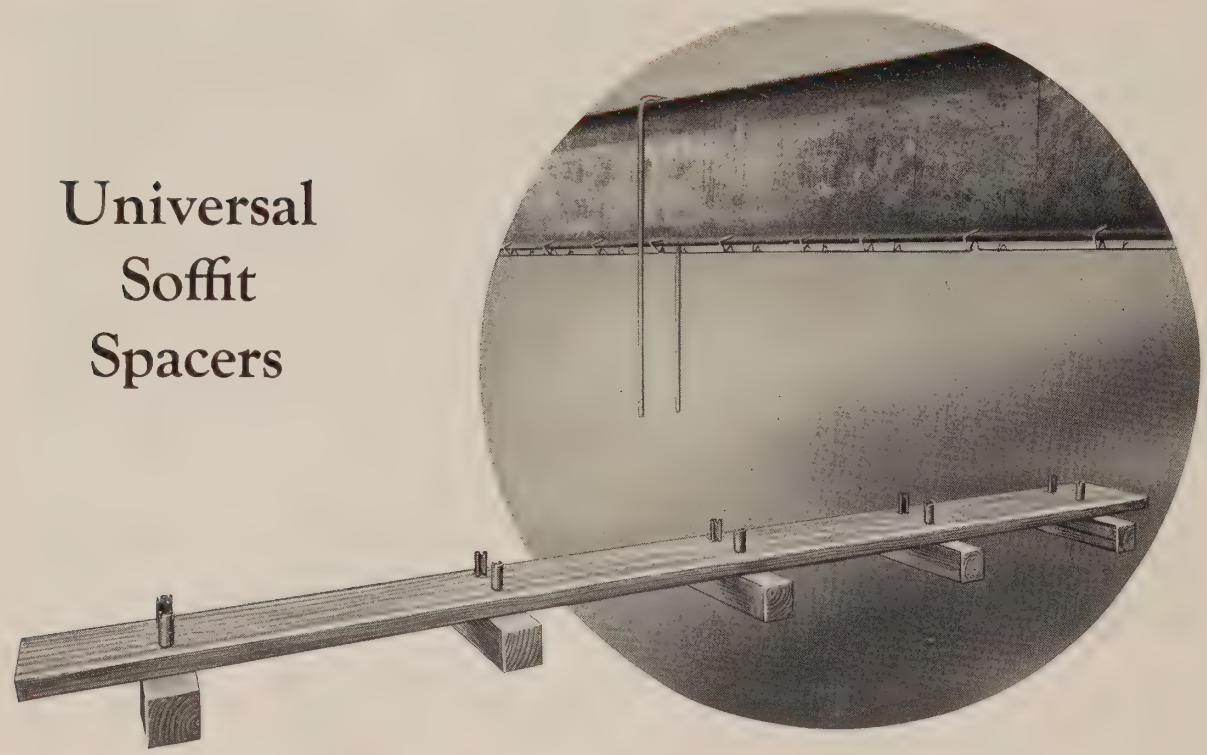
Hanging Forms with Solid Slab Construction

THIS design is of the same general principle as the one shown on page 18 and varies only in the details of joist and form floor construction. Where solid slabs are used, the spans are much shorter than with the joist construction, and it is practically never necessary to use any shoring whatever. The bottom of the slab usually comes much nearer to the top of the "I" beam, and for this reason the wooden joists supporting the form deck do not rest directly on a piece along the cleats, but are supported by a board ribbon nailed to the studs that make up the beam side. The application of this design is shown in the illustration above.





Universal Soffit Spacers

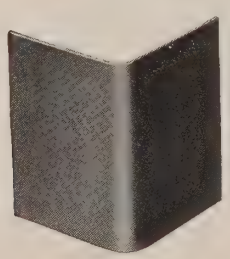


MILLIONS of the above Soffit Spacers or Separators have already been used on the largest buildings throughout the United States for separating and holding the soffit board away from the "I" beam or steel girder to insure concrete fireproofing below the beam. They are very inexpensive and pay their cost many times in the convenience and time savings they bring.

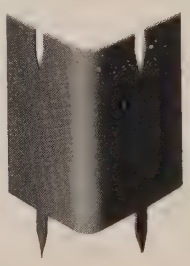
The Soffit Spacer is absolutely essential in work where the beam bottoms are suspended from the structural frame. It takes only an instant to place them at the desired intervals on the soffit board and the soffit can then be drawn up as tight as desired without changing the depth of fireproofing. It is also of decided advantage where the beam bottom is shored from below, as no matter what pressure is put on it, the correct depth of fireproofing is insured.

Soffit Spacers are used to equal advantage on fireproofed steel columns, and for spreaders for narrow wall forms.

The Type SB and Type SC Spacers, as shown below, have points which hold them firmly in the soffit board. The difference in these spacers is only a matter of width of the metal. The Type SB Spacer is made of 4″ stock; the Type SC of 2″ stock. They are made in any height.



SA

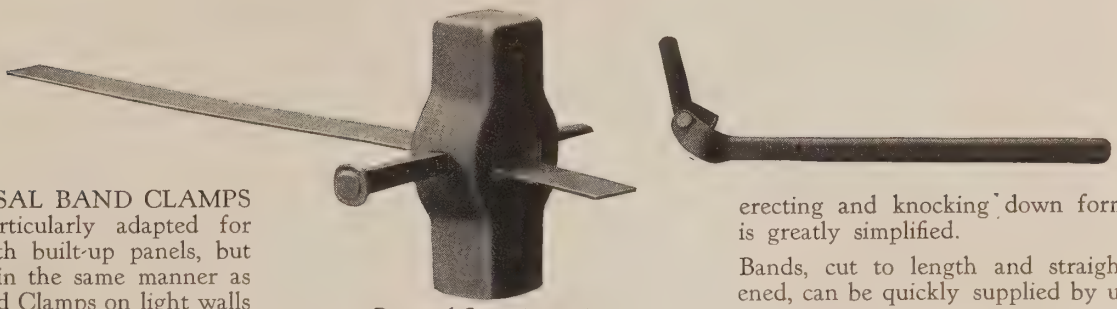


SB

SC

Universal Band Clamps

For Walls and Spandrels



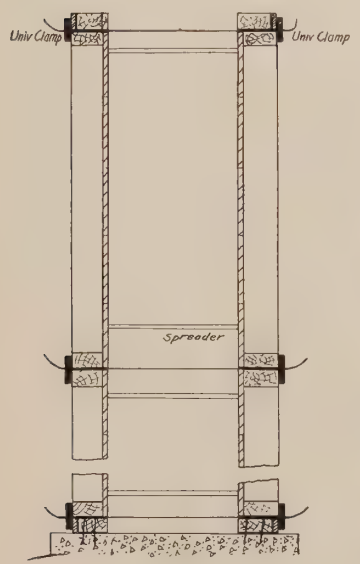
Patented Sept. 1, 1914.

UNIVERSAL BAND CLAMPS are particularly adapted for use with built-up panels, but can be used in the same manner as Universal Rod Clamps on light walls without boring holes when 2x4s on edge are used as walers. They are also widely used for tying side forms for spandrel beams.

The clamp is 3¼″ long and gives full bearing on both members of the waler. The band may be ⅝″ or ¾″ wide of 18 or 16 gauge. The band is slipped through a wedge-shaped slot in the clamp and drawn tight with the tightener. A cut nail, furnished with each clamp, is then inserted in the clamp, holding it firmly in position. The slot is so shaped that increased pressure on the band only draws the nail more firmly in place. The tightener is supplied at a small additional cost and has a 1½″ draw with each application.

These clamps will develop the entire strength of the band. Like the rod clamps, they are quickly and easily applied. Being used with built-up panels, the work of erecting and knocking down forms is greatly simplified.

Bands, cut to length and straightened, can be quickly supplied by us.

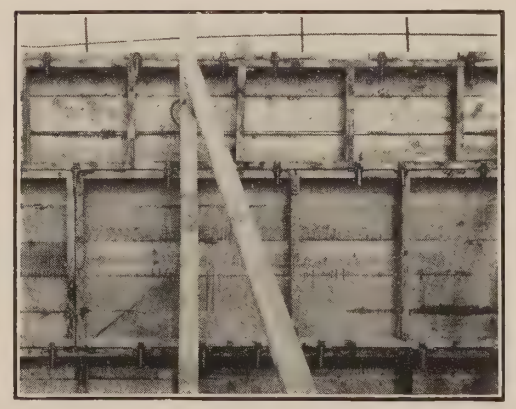


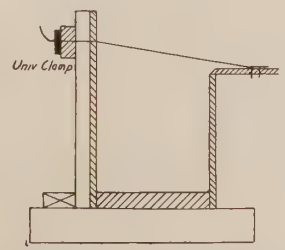
A section and view of wall showing Band Clamps used with built-up panels.

Design for Tying Forms with Universal Band Clamps

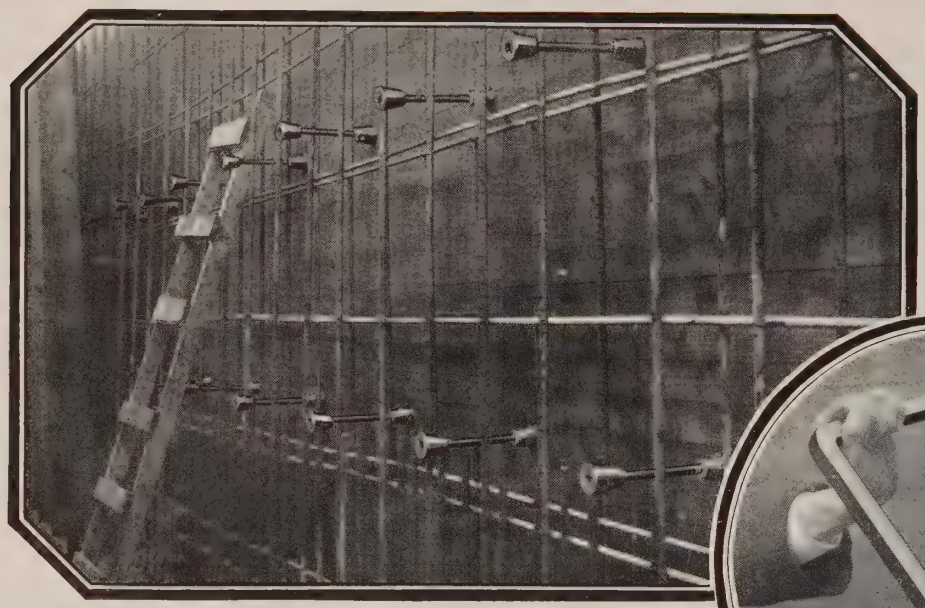
The layout at the left is a section through the wall shown in the photograph below; 2x4″ studs 2 feet on centers with top and bottom members also of 2x4″, make up panels from 8 to 12 feet long which are strapped with hoop steel. The lower panels are placed on 2x4s nailed in line flat to the footing. Bands with clamps tight on one end are laid across the 2x4s at regular intervals at each panel juncture. When the upper panel is put in place, the forms are drawn in line by tightening the bands and held in position by fastening the clamps. The same method is also used at each level and at the top.

The drawing at the right is a cross-section of a spandrel beam showing the application of the band clamp. One end of the band is nailed to the deck and the clamp fastened on the outside of the spandrel form. Straight bands of specified length are furnished for this purpose with two nail holes in one end for nailing to the deck. This eliminates L-Heads and bracing of spandrel side forms. This method of tying spandrel forms is widely used by contractors.





A section showing the Band Clamp used for Spandrel Beams.



Universal Cone Nuts in position in wall of a large sewage disposal plant. The back form is erected, the stud rods run through the walers, and the center rod (which acts as a spreader) with cone nuts threaded onto the studs. The front form will be fastened in place by threading its stud rods into the front cone.

Cone nuts are quickly removed from the wall with this wrench, which fits into the square socket of the cone nut.

Universal Cone Nuts

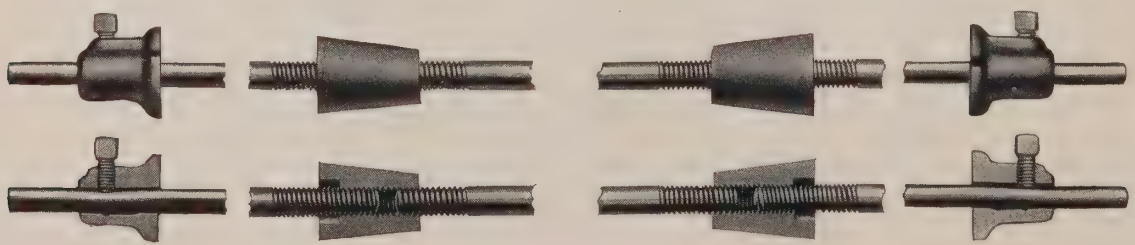
Rod Couplings for Water-Tight Walls

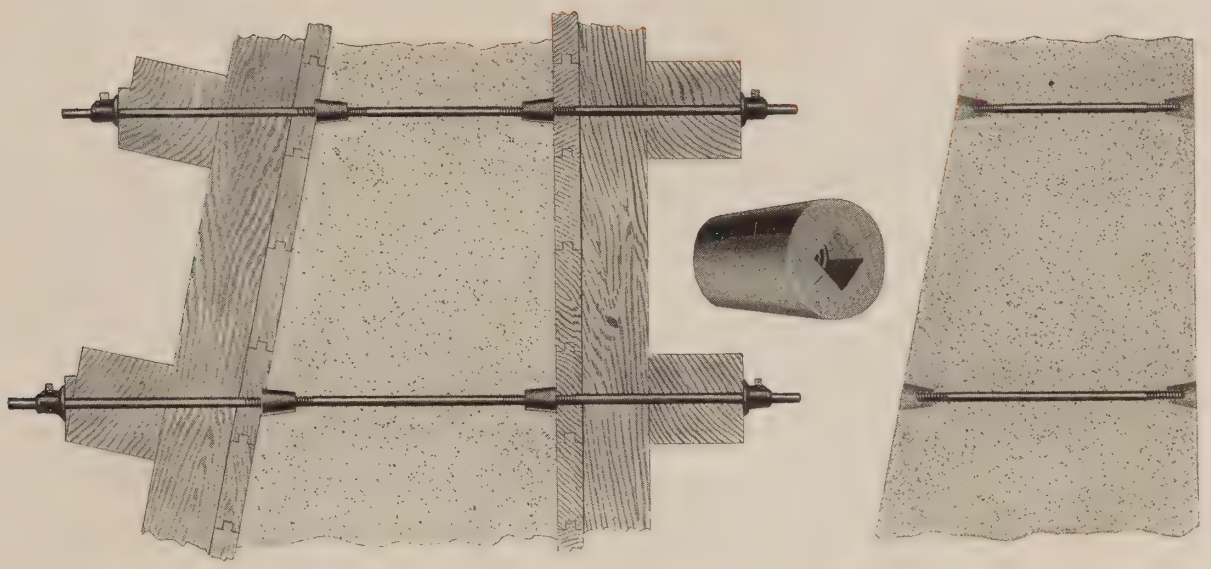
Patented.

UNIVERSAL CONE NUTS space the forms and hold them rigid while the concrete is being poured. They are particularly adapted for tying forms on reservoir work, sewage disposal plants, etc., where a water-tight and acid-proof job is required. The specifications on this type of work provide against the exposed ends of rods in the wall.

Universal Cone Nuts are rod couplings, placed so that the large end of the cone is flush against the inside of the form walls. The tie rod, which also serves as a spacer or separator, is threaded into the small ends of the cone nuts, holding them firm against the inside walls of the form. A stud rod, threaded on one end, threads into the large end of the cone nut and passes through the wall form. A Universal Form Clamp is used on the outside end of this stud rod, thereby eliminating the thread on the outer end protruding through the forms.

The advantage of form clamps is immediately perceived, in that form lumber may vary in size on the same job, necessitating various lengths of stud rods threaded at





both ends if nuts and washers are used. The form clamps make necessary only 1″ of thread on the inner end of the rod entering the cone nuts, allowing the outer end to project any distance desired beyond the forms and permitting a wide range of adjustment without variation of rods.

The large end of the cone nut is cast with a square socket to receive a wrench supplied with the cone nuts, by means of which they are removed from the wall after the forms are stripped.

Concrete is easily grouted in the conical hole left by the nut and is anchored to the threads of the projecting ends of the center rod. No steel is exposed. This system is approved by the leading sanitary and hydraulic engineers throughout the country.

Costs by means of this method are reduced to a minimum. The cone nuts and stud rods can be used again and again; only the tie rods remain in the wall.

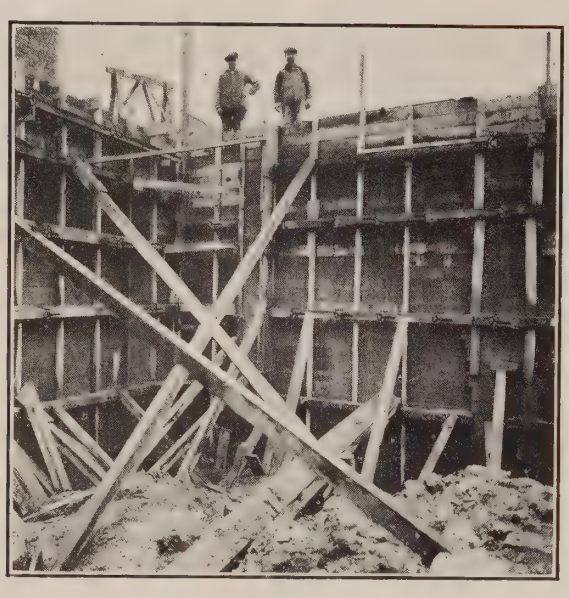
The standard sizes and weights of Universal Cone Nuts are shown on page 25. Center and stud rods, properly threaded, are quickly furnished by us.

Universal Rod Couplings

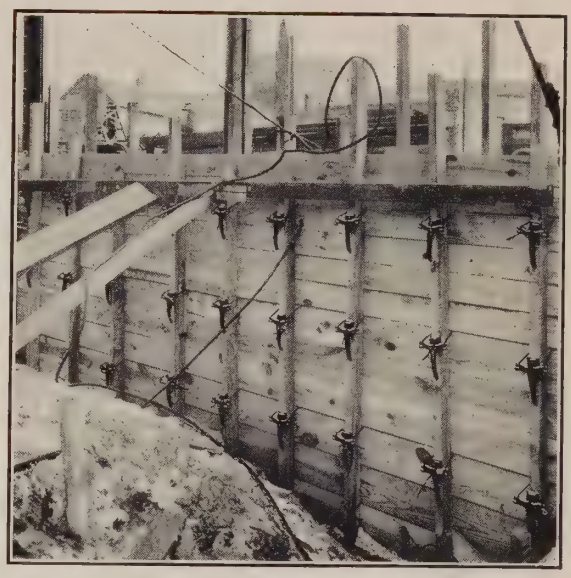
(Hexagonal)

UNIVERSAL HEXAGONAL ROD COUPLINGS find a wide use in form work when it is not required to salvage these castings for re-use. They are applied in an identical manner, and for the same purpose as Universal Cone Nuts, with the exception that hexagonal couplings are located about 1″ or more inside the wall form. When the outer stud rod is removed and the hole that it has left is filled with neat cement, a clean, unblemished wall remains with no exposed metal.

Universal Hexagonal Couplings are designed to develop the full strength of the rod and meet the requirements of the Government for continuous reinforcement. They are, therefore, much used for butt joining of reinforcing steel in heavy work. Standard sizes and weights are shown on page 25.



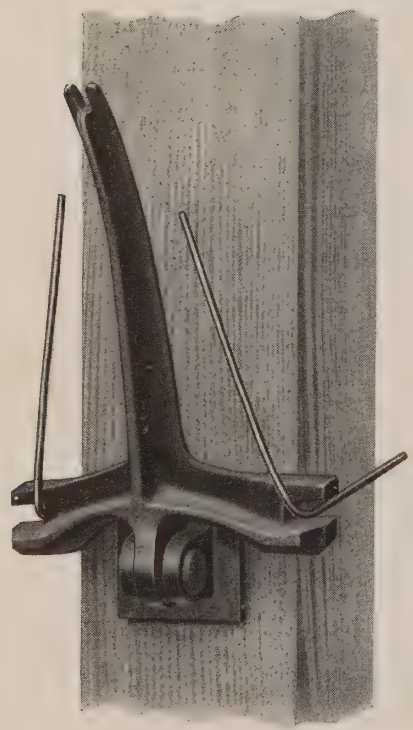
Universal Wire Clamps were used with 2x4 walers on this wall.



Universal Wire Clamps can also be used directly on the studding, as shown above.

Universal Wire Clamps

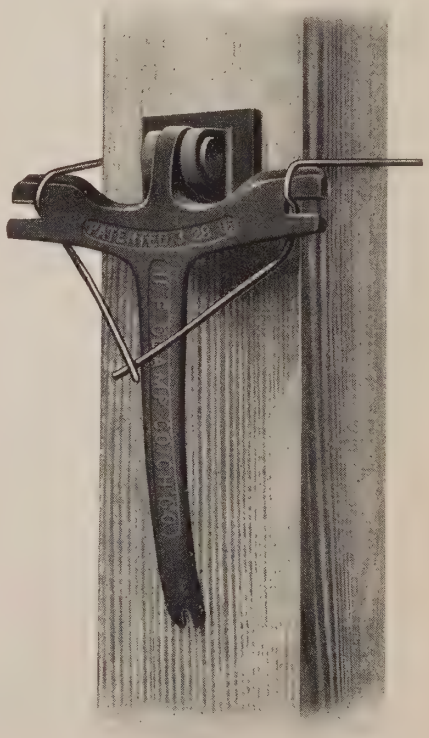
Patented March 27, 1917.



Position on form before clamping.

THESE cuts show the Universal Wire Clamp before and after clamping. It is a self-contained unit and, because it is self-locking, no loose parts are required to fasten it in place. The hinged base gives firm bearing against the studding or waler. As the clamp is snapped into place, it has a 1½" draw on the wire. All of the tightening is done from the outside of the form. This is a particular advantage in narrow walls, as all twisting of wire is eliminated. Over-twisted wire may be stressed past its elastic limit, to break when a load is applied, yet its condition is not apparent from inspection. This cannot happen with Universal Wire Clamps. Sizes and weights are shown on page 25.

We furnish wire straightened and cut to length.



Position on form after clamping.

Sizes of Universal Form Clamps

Clamp	Size of Rod	Base Diam.	Length	Wt. Per 100
No. 1	1/4"	2 "	1 3/8"	60 lbs.
" 2	3/8"	2 3/8"	1 7/8"	107 "
" 3	1/2"	2 1/2"	2 "	126 "
" 4	5/8"	3 "	2 "	235 "
" 4x	5/8"	3 1/4"	2 3/4"	267 "
" 5	3/4"	4 5/8"	3 1/2"	520 "

Carrying Capacity of Form Clamps and Rods

The table below is based on the Screw of the Clamp being properly set. When it is so adjusted, Nos. 1, 2, and 3 clamps will hold past the rupturing point, Nos. 4, 4x and 5, past the elastic limit of the rods, by actual test. It is taken that mild steel rods are used, with a tensile strength figured at 16,000 pounds per square inch. The bearing strength is based on 400 pounds to the square inch and applies to the wooden member against which the clamp rests.

Clamp	Size of Rod	Area of Base	Bearing Capacity	Rod Capacity
No. 1	1/4"	3.07 sq. in.	1200 lbs.	785 lbs
" 2	3/8"	4.43 " "	1772 "	1765 "
" 3	1/2"	4.66 " "	1865 "	3150 "
" 4	5/8"	6.70 " "	2680 "	4850
" 4x	5/8"	7.93 " "	3170 "	4850 "
" 5	3/4"	16.20 " "	6480 "	7050 "

Universal Wire Clamps

Clamp	Wire	Width	Wt. Per 100
No. 1 Wire Clamp	No. 8, 9 or 10 Wire	2 1/4"	135 lbs.
" 2 " "	" " " " "	4 1/4"	150 "

Universal Cone Nuts (Couplings)

Nut	Size of Rod	Base Diam.	Length	Wt. Per 100
No. 2	3/8"	1 9/16"	2 1/8"	45 lbs.
" 3	1/2"	2 "	2 5/8"	108 "
" 4	5/8"	2 "	2 5/8"	112 "
" 5	3/4"	2 13/16"	3 3/8"	235 "
" 6	7/8"	2 5/8"	3 1/2"	280 "

Unversal Rod Couplings (Hexagonal)

Coupling	Size of Rod	Diam. (flat)	Length	Wt. Per 100
No. 3	1/2"	1 "	1 1/2"	30 lbs.
" 4	5/8"	1 1/8"	1 11/16"	40 "
" 5	3/4"	1 3/8"	1 15/16"	65 "
" 6	7/8"	1 5/8"	2 5/16"	115 "
" 7	1"	1 7/8"	2 11/16"	170 "

Sizes and Specifications of Symons Column Clamps

Illustrated on page 48.

(IMPORTANT: "Size of Clamp" indicates length of clamp arm only. Does not mean size of column for which clamp is suitable.)

Size of Clamp Inches	Arms (Mild Steel) Inches	Weight Lbs.	Adjustment Inches	Size of Columns (Square or Rectangular) for which Clamps are Suitable Inches
36 x 36	2 x 5/16 x 36 long	24	17	25 x 25 down to 9 x 9 net of Conc.
48 x 48	2 1/2 x 3/8 x 48 long	43	22	36 x 36 down to 14 x 14 net of Conc.
60 x 60	3 x 3/8 x 60 long	70	24	48 x 48 down to 24 x 24 net of Conc.
48 x 72	2 1/2 x 3/8 x 72 long	70	24	34 x 58 down to 12 x 36 net of Conc.
72 x 72	2 1/2 x 3/8 x 72 long	80	30	58 x 58 down to 36 x 36 net of Conc.

Above specifications are for column forms made of 2-inch boards.
With 1-inch boards, size 36 inch is suitable for columns 26x26 inches down to 10x10 inches, etc.

Sizes of Tightening Wrenches

No. 1. To be used with No. 1 Clamps. Weight, 4 lbs.
No. 2. To be used with No. 2 Clamps. Weight, 4 lbs.
No. 3. To be used with No. 3 Clamps. Weight, 4½ lbs.
No. 4. To be used with No. 4 Clamps. Weight, 5½ lbs.
No. 5. To be used with No. 5 Clamps. Weight, 5½ lbs.

Part List

	Number of Tightener and Rod Sizes				
	No. 1—¼″ Rod	No. 2—⅜″ Rod	No. 3—½″	No. 4—⅝″ Rod	No. 5—¾″ Rod
Name of Part	Part No.	Part No.	Part No.	Part No.	Part No.
Screw	101	102	200	300	400
Nut	103	103	201	401	401
Handle	104	104	104	104	104
Cam	105	105	105	105	105
Handle Pin	106	106	106	106	106
Cam Pin	107	107	107	107	107

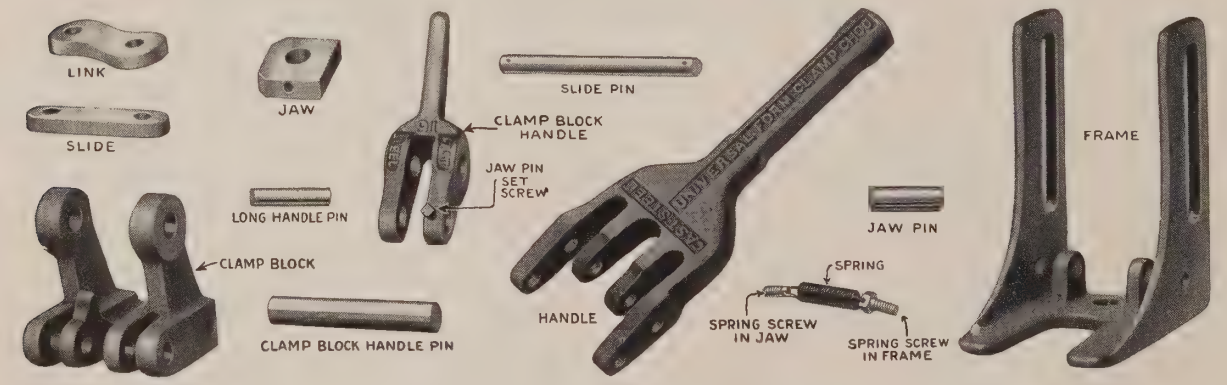
(IMPORTANT: Order all repair parts for tighteners and pullers by number.)

Rod Pullers

No. 1. For pulling ¼″, $\frac{5}{16}$, ⅜″ and ½″ rods not longer than 4′. Weight, 23 lbs.

No. 2. For heavy work. Takes rods from ¼″ to ¾″. Weight, 32 lbs.

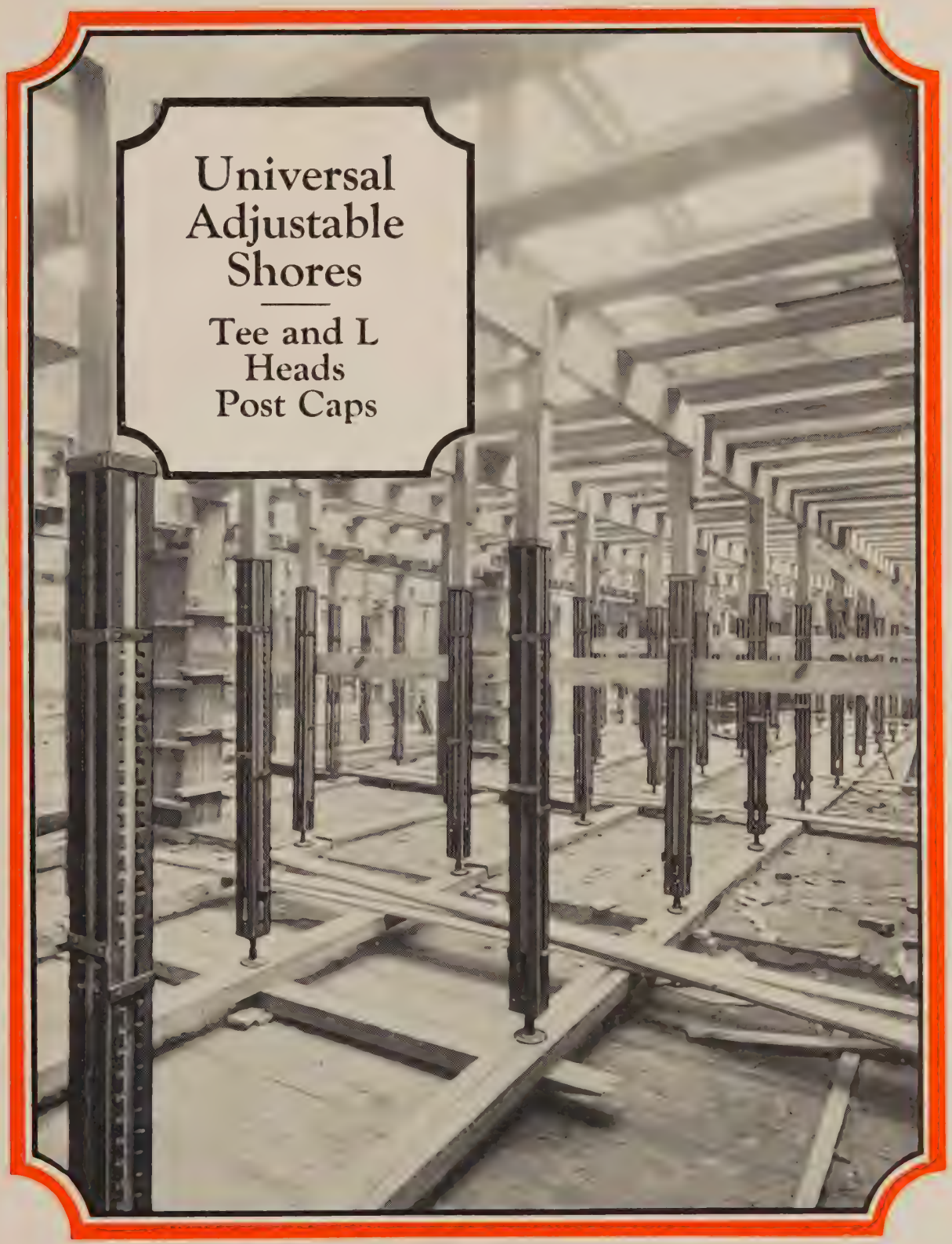
Jaw for only one size of rod furnished. State size of jaw or rod on which puller is to be used, when ordering.



Part List

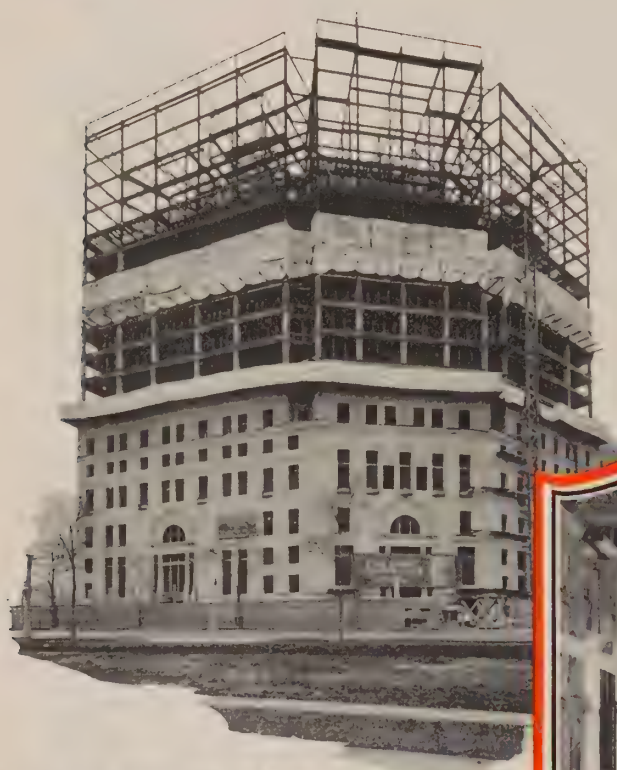
Name of Part	No. 1 Puller Part No.	No. 2 Puller Part No.	Name of Part	No. 1 Puller Part No.	No. 2 Puller Part No.
Handle	P21	P1	Jaw Pin	P30	P10
Short Handle Pin	P22	P2	Clamp Block Handle Pin	P31	P11
Long Handle Pin	P23	P3	Clamp Block Handle	P32	P12
Link	P24	P4	Spring Screw in Jaw	P33	P13
Slide Pin	P25	P5	Spring	P34	P14
Slide	P26	P6	Spring Screw in Frame	P35	P15
Clamp Block	P27	P7	Slide Cap Screw	P36	P16
Frame	P28	P8	Jaw Pin Set Screw		P17
*Jaw	P29	P9	Cotter Pins	P38	P18

*When ordering Jaws state size of rod being used as well as part number.



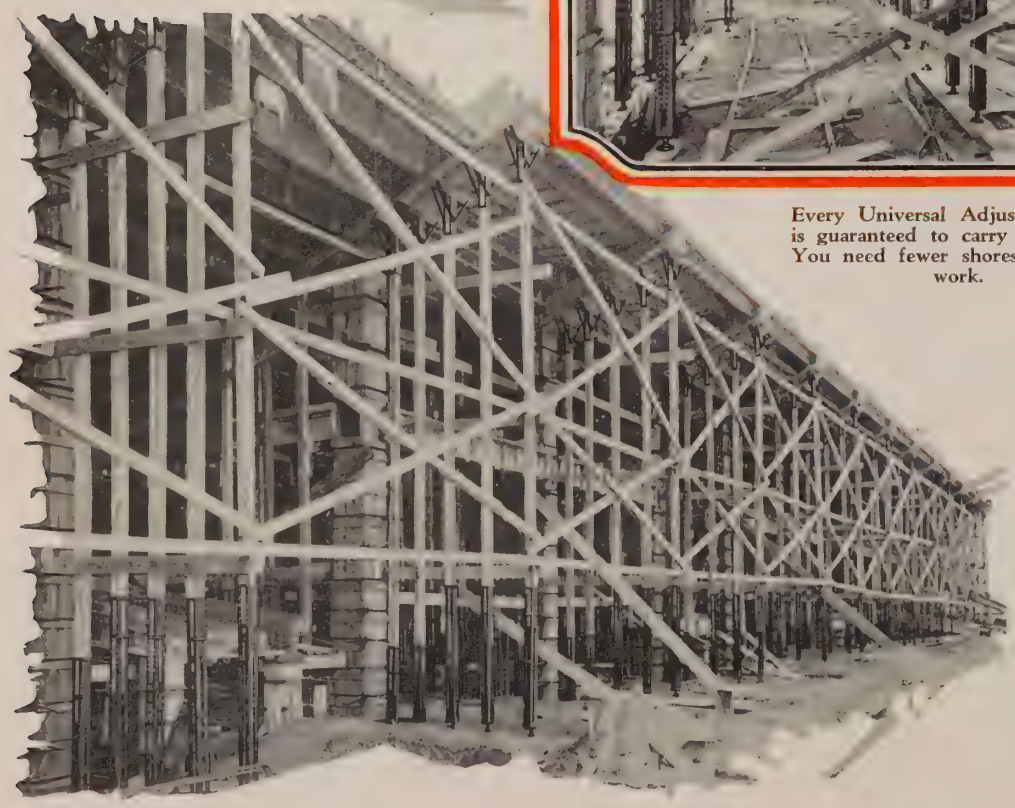
Universal Adjustable Shores

Tee and L Heads Post Caps



Universal Adjustable Shores eliminated cutting, splicing and wedging in the shoring work on this building.

Every Universal Adjustable Shore is guaranteed to carry 12,000 lbs. You need fewer shores to do the work.



Instantly adjustable to the varying heights of these rising tiers, Universal Shores effected big savings in the erection of this stadium.

Universal Adjustable Shores

Patented April 1, 1919; Oct. 28, 1924; June 16, 1925; March 27, 1927. Others pending.

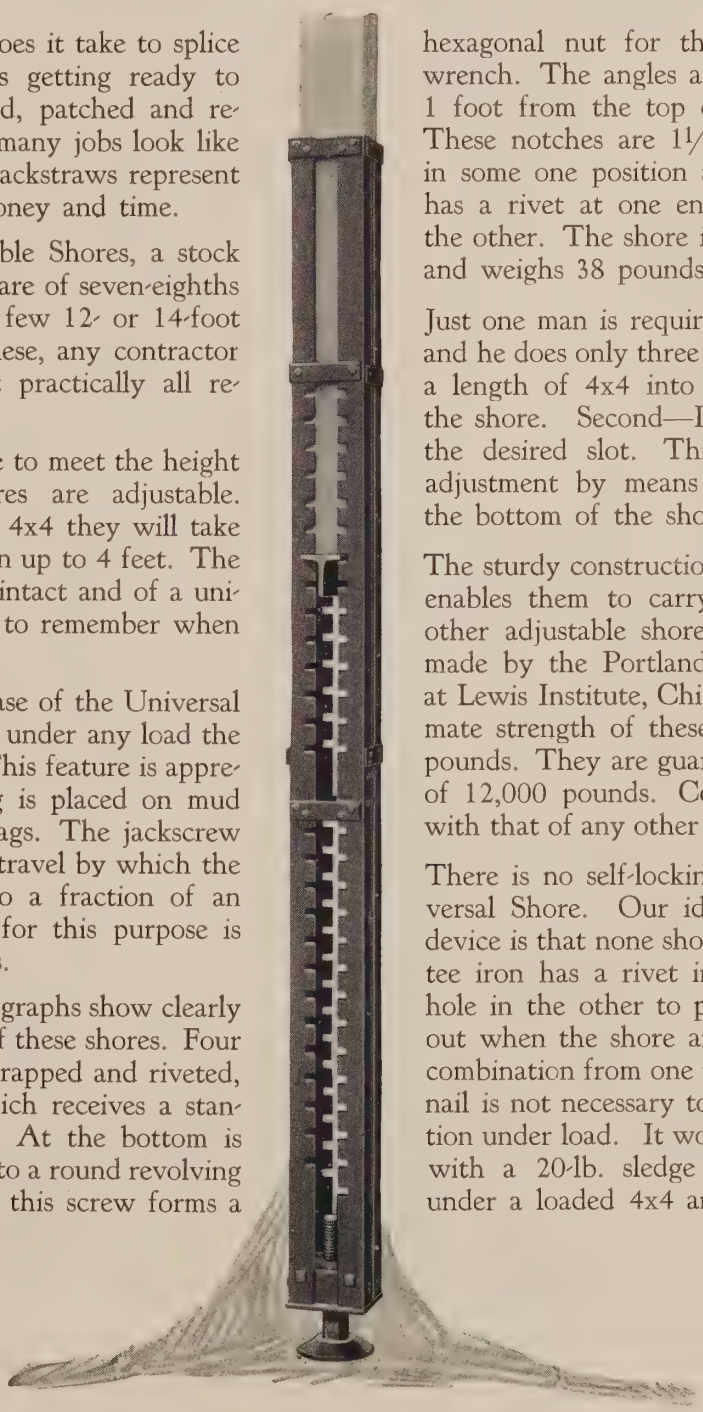
HOW much money does it take to splice and scab old 4x4s getting ready to shore each job? The old, patched and reworked 4x4s that make many jobs look like a forest of second-hand jackstraws represent a considerable loss in money and time.

With Universal Adjustable Shores, a stock of 8-foot 4x4s will take care of seven-eighths of the shoring. With a few 12- or 14-foot lengths in addition to these, any contractor is equipped to shore at practically all required heights.

It isn't necessary to splice to meet the height —these Universal Shores are adjustable. With any one length of 4x4 they will take care of all height variation up to 4 feet. The 4x4s are kept clean and intact and of a uniform size—a good point to remember when buying new lumber.

With the screw at the base of the Universal Shore, it can be adjusted under any load the same as any jackscrew. This feature is appreciated when the shoring is placed on mud sills or if the centering sags. The jackscrew at the bottom has 3" of travel by which the shore can be adjusted to a fraction of an inch. An end wrench for this purpose is supplied with the shores.

The accompanying photographs show clearly the simplicity of design of these shores. Four steel angles 1½"x⅛", strapped and riveted, form the metal cage which receives a standard dressed 4x4 post. At the bottom is the 1¼" jackscrew set into a round revolving base. The lower part of this screw forms a hexagonal nut for the application of the wrench. The angles are notched, beginning 1 foot from the top down to the bottom. These notches are 1½" apart and contain in some one position a standard tee which has a rivet at one end and a nail hole in the other. The shore is 5 feet 6 inches high and weighs 38 pounds.



Just one man is required to erect this shore and he does only three things. First—Drops a length of 4x4 into the steel member of the shore. Second—Inserts the tee iron in the desired slot. Third—Makes the final adjustment by means of the jackscrew at the bottom of the shore.

The sturdy construction of Universal Shores enables them to carry far more than any other adjustable shore. The series of tests made by the Portland Cement Association at Lewis Institute, Chicago, showed the ultimate strength of these shores to be 20,000 pounds. They are guaranteed for a safe load of 12,000 pounds. Compare this safe load with that of any other shore.

There is no self-locking device on the Universal Shore. Our idea of such a locking device is that none should be necessary. The tee iron has a rivet in one end and a nail hole in the other to prevent it from falling out when the shore and post are moved in combination from one place to another. This nail is not necessary to keep the tee in position under load. It would take several blows with a 20-lb. sledge to dislodge this tee under a loaded 4x4 and then only one side

could be dislodged. The screw can be turned only with the wrench.

The absence of self-locking devices permits easy and accurate reshoring with Universal Adjustable Shores. Self-locking devices must settle before they grip, whereas the adjustable screw in the base of the Universal raises the shore to meet the load.

Universal Adjustable Shores are of metal. There are no wooden parts to weather, work loose and become broken. These shores need only a little oil on the screw and an occasional coat of creosote paint, and with no other care whatever will last fifteen years under continual use. This is a very conservative estimate.

These Universal Shores will use stocks of old 4x4s. Every contractor has a yard full of random length 4x4s which he is continually splicing and sawing for reshoring. Practically every one of these posts can be used without the cost of this carpentering with Universal Shores.

Here are just a few of the things that the use of Universal Shores will save. When new 4x4s are bought for shoring, they must be cut to length or at least squared off. If old 4x4s are used, they have to be spliced or again cut to length. Wedges have to be cut, two for each post, pounded in and nailed. If the elevation is changed, these nails have to be pulled and the wedges have to be pounded and nailed again. All this is done with a few turns of the jack-screw on the Universal Shore. The time needed for squaring ends, splicing 4x4s, making wedges and erecting with them, comes to a large figure on the cost sheet, a figure that can be eliminated with Universal Shores.

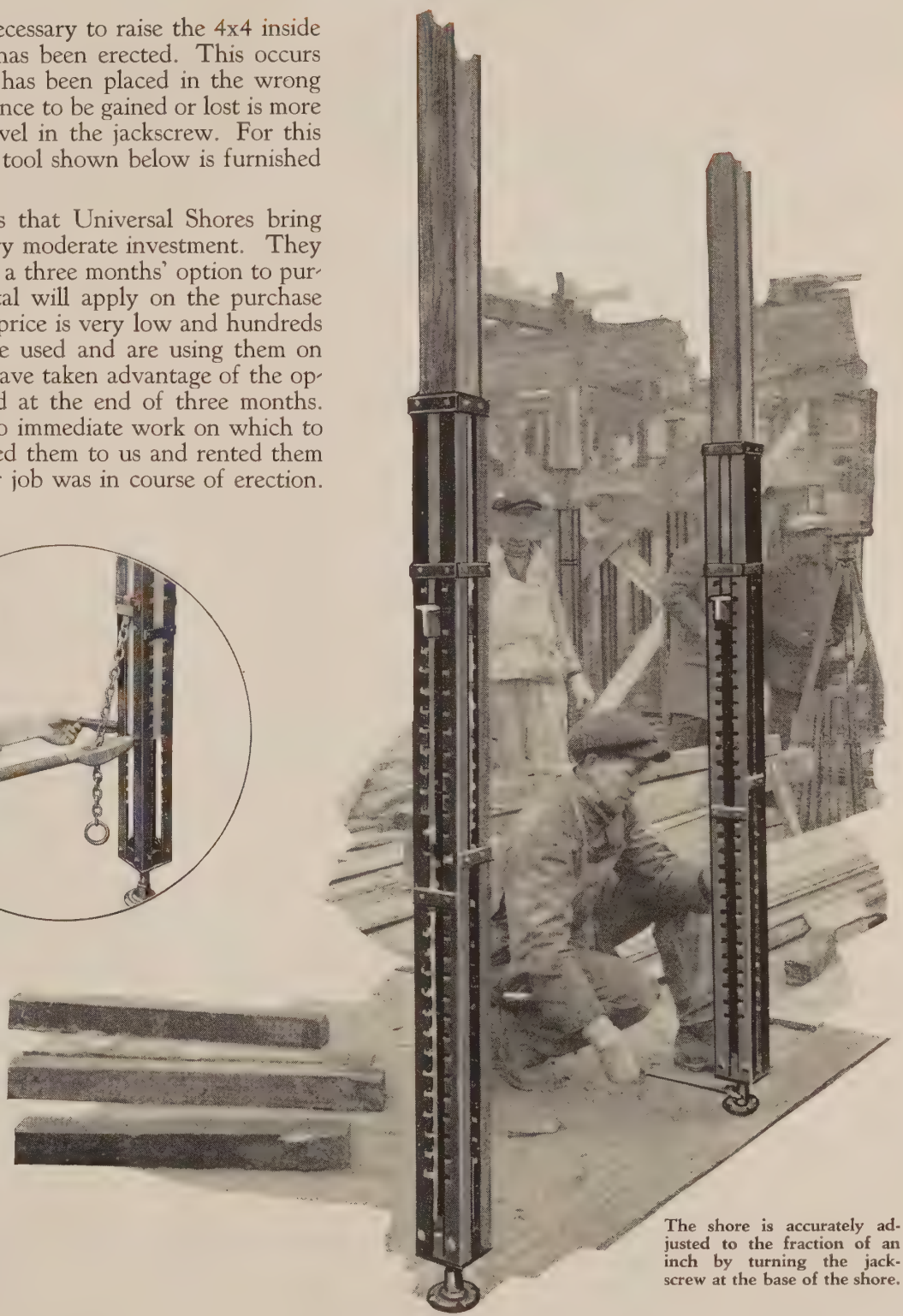
A few turns of the jackscrew on the Universal Shore releases the load gently. There is no danger of cracks appearing in the ceiling. The shore and post can be moved without changing the height to a similar story or another part of the same floor, or readjusted for another height.

Simply drop a 4x4 into the Universal Shore and insert the tee iron at the desired height. Final adjustment is made with the jackscrew at the base of the shore.

It is occasionally necessary to raise the 4x4 inside the shore after it has been erected. This occurs when the tee iron has been placed in the wrong notch and the distance to be gained or lost is more than the 3″ of travel in the jackscrew. For this purpose the lifting tool shown below is furnished with the shores.

All the advantages that Universal Shores bring can be had at a very moderate investment. They can be rented with a three months' option to purchase and the rental will apply on the purchase price. This rental price is very low and hundreds of contractors have used and are using them on this basis. Many have taken advantage of the option and purchased at the end of three months. Others who had no immediate work on which to apply them returned them to us and rented them later when another job was in course of erection.

This lifting tool facilitates adjustment of shore when height to be gained is greater than range of jackscrew.



The shore is accurately adjusted to the fraction of an inch by turning the jackscrew at the base of the shore.

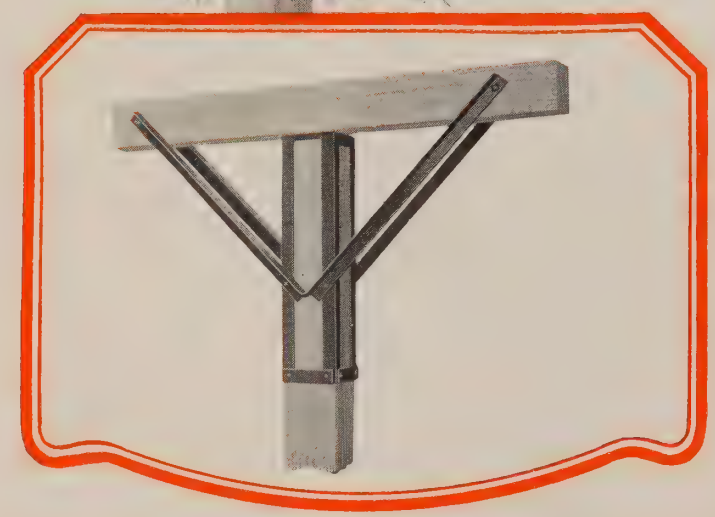
Universal Tee and L Heads

Patented Dec. 28, 1926; March 27, 1927.

UNIVERSAL combination steel and wood Tee Heads and L Heads (for spandrels) come ready to use. They are dropped over the top ends of 4x4s forming a finished tee head. They can be used with or without Universal Adjustable Shores. The tee head is completed in a fraction of the time required by the hand method and saves lumber and the carpenter's time.

The Universal Tee Head is an angle iron frame, riveted into one solid piece, bolted to a 4x4, 36″ long and is used for interior beams. The 4x4 cross-piece of the L Head is 54″ long, offset for exterior beams. They give an absolutely solid support and yet are easily slipped on and off and can be used again and again. The Universal Tee Head does not have to be scrapped when the 4x4 goes. It will outlast several 4x4s and give years of satisfactory service.

On a job containing a large number of beams, Universal Tee and L Heads effect savings in labor and lumber that grow to considerable proportions. A complete tee head can be assembled in one minute. When the tees are no longer needed they can be dismantled with the same speed, leaving only the plain 4x4s to be used either under slab shoring or beams on the next job.



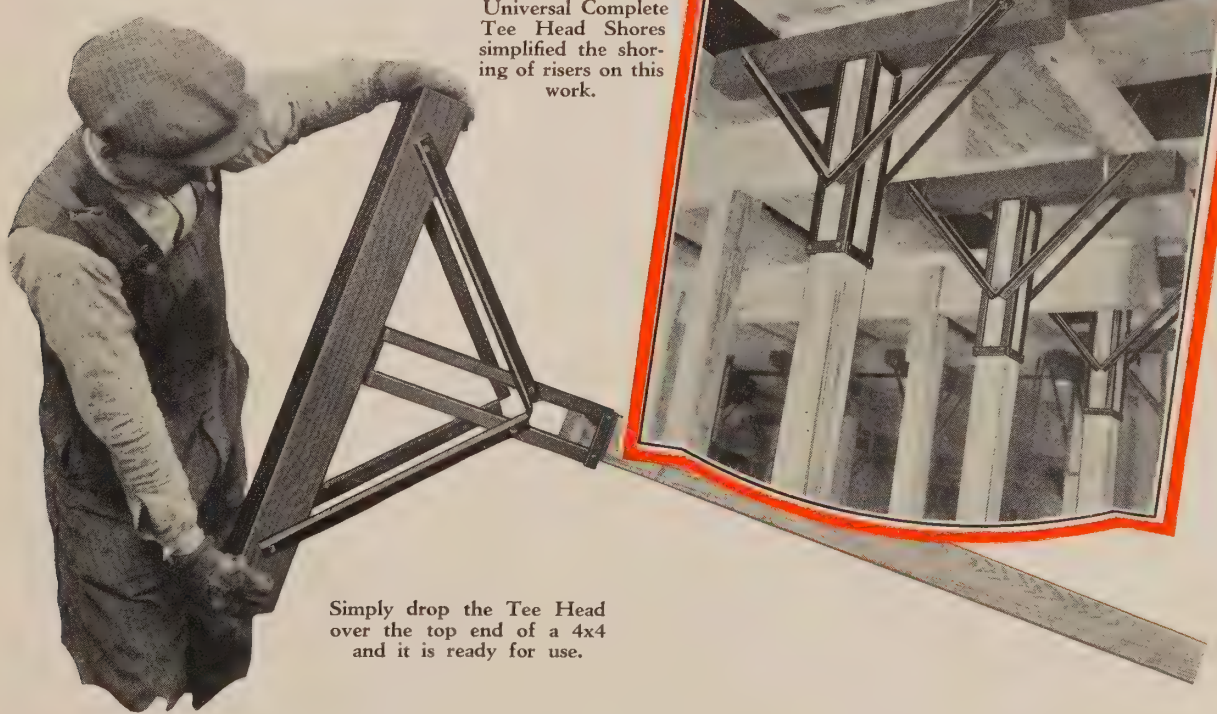
The solid one-piece Tee Head slips over the top end of the 4x4. The L Head is offset for exterior beams.

When hoisting a great many trips can be saved with Universal Tee Heads. One load of Tee Heads, and one load of plain posts equal in quantity six loads of built up heads when raising on a skip. Skip hoist time is valuable and it pays to hoist the heads and posts separately.

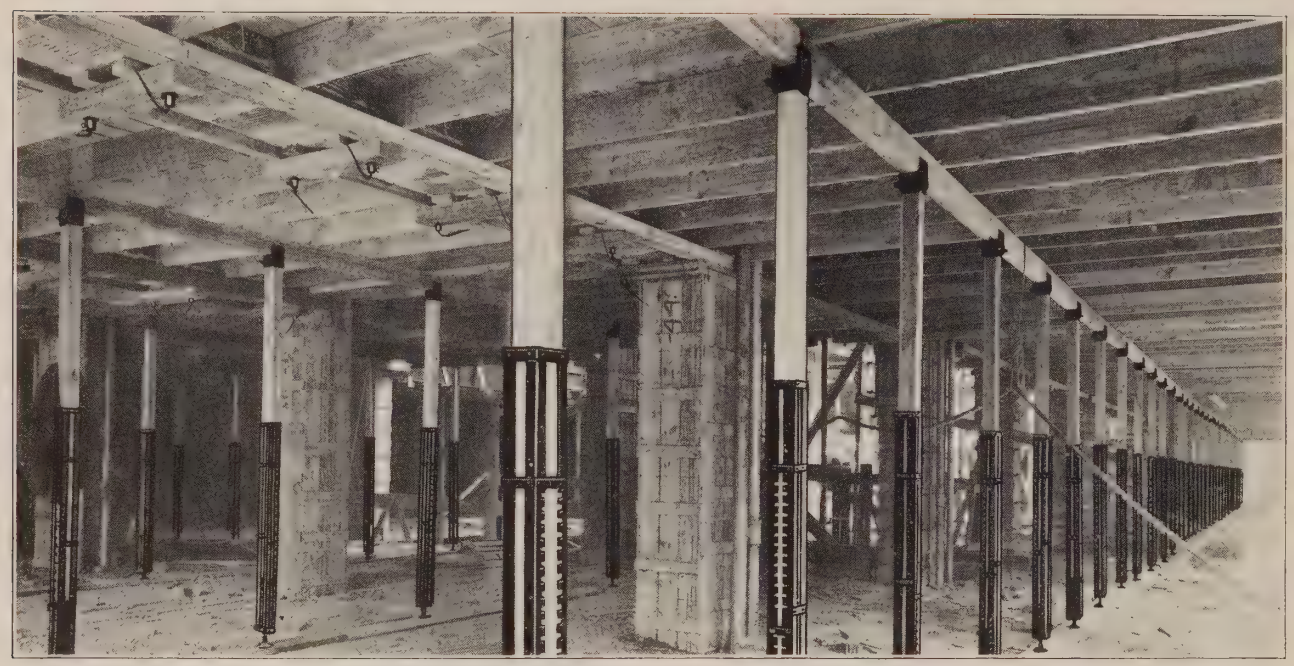
The Tee Heads take up little space and can be stored for future use. The savings in cartage represent another big saving. It's an expensive proposition to haul built-up Tee Heads back and forth from job to yard. 350 Universal Tee Heads can be hauled as against 125 built-up Tee Heads and posts on the same truck.

Universal Tee and L Heads can be rented on a monthly basis at a very moderate price with a three months' option to buy. The rental will apply on their purchase.

Universal Complete Tee Head Shores simplified the shoring of risers on this work.



Simply drop the Tee Head over the top end of a 4x4 and it is ready for use.



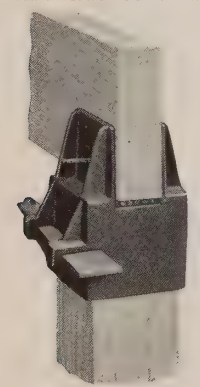
These Universal Post Caps hold the ledgers in place on the post without scabs or nails.

Universal Post Caps

Patented December 28, 1926. Other patents pending.

UNIVERSAL POST CAPS add considerably to the life of 4x4 shores and save the labor involved in nailing on scabs, or of cutting away 4x4 shores to receive the joist or ledger. The ends of the 4x4s are kept intact because no scabs are nailed to them every time they are erected. Universal Post Caps easily slip over the heads of 4x4 shores and provide a metal socket or chair to receive the joist or ledger. The cap is held in place on the shore by a wedge, integral with the casting, and remains on the shore as long as it is needed. If the same shore is used five different times on one building, it will not be necessary to scab this shore each time. The post cap eliminates this labor. No nails are needed to fasten the cap to the 4x4. Nail holes are provided in the brackets which hold the joist or ledger, but their use is optional and not necessary.

Universal Post Caps are made in two sizes — one for 2" width lumber and the other for 4" width lumber.



Universal Post Caps are made in two sizes. This is for 2" lumber.

Universal Post Cap for 4" lumber. Note the integral wedge for holding cap in place.

Design of Formwork

ONE of the largest items in the cost of concrete construction is the cost of the formwork, and for that reason it is very important that the forms should be scientifically and economically designed. They must be strong enough and stiff enough to carry the weight of the wet concrete and any other load which may come on them during construction without breaking or deflecting unduly.

The tables on page 36 will be found very valuable in determining the size and spacing of sheathing, joists, girts and posts. The spacings given are based on what experience has shown to be allowable safe values of the strength and deflection of the different members.

The forms should be designed for each particular job because the layout is affected by such special considerations as the size of the floor panels and the size of the lumber available. When these considerations have been determined, the tables may be used to assure that the forms shall be sufficiently strong and stiff without waste of lumber.

Example of Design of Forms for 6″ Slab

Decking. Using dressed lumber ¾″ thick, the maximum span for 6″ slab is given by the tables on page 36 as 25″.

Joists. Assume that the size of the panel is such that a 6-foot span of joists is desirable. The table shows that the maximum spacing for 2x6″ joists is 15½″, while that for 2x8″ joists is 29″. The 2x8″ joists will therefore be used spaced 25″ on centers, which is as much as the decking will allow.

Girts. For 6″ slab and 6′ joists span the table gives 4 feet 1 inch as the maximum span for 4x6″ girts. Since the girts can be made continuous for three spans, the span length can be increased 10%, which gives 4 feet 6 inches. The posts will therefore be spaced 4 feet 6 inches apart and 13-foot 6-inch girts can be used.

Posts. The area of forms to be supported by one post is equal to the joists span multiplied by the girt span, or 6 x 4½″ — 27 square feet. The table shows that a 3x4″ post provides the required bearing area, but 4x4″ posts will be adopted as being the minimum practicable size for ordinary work.

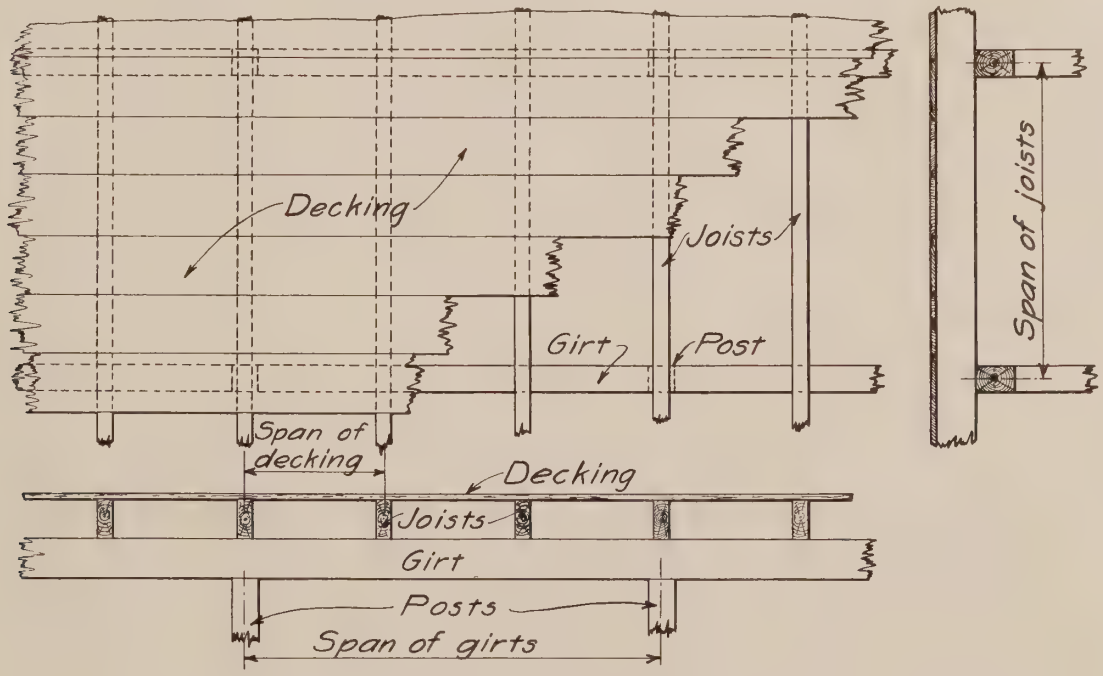


DIAGRAM OF SLAB FORMS

SLAB FORMS

MAX. SPAN OF GIRTS (ft. & in)

Max. moment = $\frac{1}{8}$ w s l^2 ÷ 12
w = weight of slab per sq. ft. plus 75 lb per sq. ft live load
s = span of joists in feet
Max. fiber stress = 1200 lb. per sq. in.
Max. deflection = $\frac{1}{360}$ l
l = span of girt in feet
For girts continuous for 3 or more spans, max. span is 10% greater than given
For girts 6" wide, max. span is 20% greater than span for girts 4" wide

Thickness of slab, and "w"		4" 125 lb/sq ft	5" 138	6" 150	7" 163	8" 175	9" 188	10" 200	11" 213	12" 225
Size of girt	Span of joists									
3×6 (2½"×5½")	4'	4-9	4-6	4-4	4-2	4-0	3-11	3-9	3-8	3-6
	5'	4-3	4-0	3-11	3-9	3-7	3-5	3-4	3-3	3-2
	6'	3-11	3-9	3-6	3-4	3-3	3-2	3-1	3-0	2-11
	7'	3-7	3-5	3-3	3-1	3-0	2-11	2-10	2-9	2-8
	8'	3-4	3-2	3-1	2-11	2-10	2-9	2-8	2-7	2-6
	9'	3-2	3-0	2-11	2-9	2-8	2-7	2-6	2-5	2-4
	10'	3-0	2-11	2-9	2-7	2-6	2-5	2-4	2-4	2-3
	11'	2-11	2-9	2-7	2-6	2-5	2-4	2-3	2-2	2-2
	12'	2-9	2-7	2-6	2-5	2-4	2-3	2-2	2-1	2-1
4×6 (3½"×5½")	4'	5-6	5-3	5-1	4-10	4-8	4-6	4-5	4-3	4-2
	5'	4-11	4-8	4-6	4-4	4-2	4-0	3-11	3-10	3-8
	6'	4-6	4-4	4-1	3-11	3-10	3-8	3-7	3-6	3-4
	7'	4-2	4-0	3-10	3-8	3-6	3-5	3-4	3-2	3-2
	8'	3-11	3-9	3-7	3-5	3-4	3-2	3-1	3-0	2-11
	9'	3-8	3-6	3-4	3-3	3-1	3-0	2-11	2-10	2-9
	10'	3-6	3-4	3-2	3-1	2-11	2-10	2-9	2-8	2-7
	11'	3-4	3-2	3-0	2-11	2-10	2-9	2-8	2-7	2-6
	12'	3-2	3-0	2-11	2-10	2-8	2-7	2-6	2-5	2-5
4×8 (3½"×7½")	4'	7-6	7-2	6-11	6-7	6-4	6-2	5-11	5-9	5-7
	5'	6-9	6-5	6-2	5-11	5-8	5-6	5-3	5-2	5-0
	6'	6-2	5-10	5-7	5-5	5-2	5-0	4-10	4-9	4-7
	7'	5-8	5-5	5-2	5-0	4-10	4-8	4-6	4-4	4-3
	8'	5-4	5-1	4-11	4-8	4-6	4-4	4-2	4-1	4-0
	9'	5-0	4-9	4-7	4-5	4-3	4-1	4-0	3-10	3-9
	10'	4-9	4-6	4-4	4-2	4-0	3-11	3-9	3-8	3-7
	11'	4-6	4-4	4-2	4-0	3-10	3-8	3-7	3-6	3-5
	12'	4-4	4-2	4-0	3-10	3-8	3-7	3-5	3-4	3-3
4×10 (3½"×9½")	4'	9-6	9-1	8-8	8-4	8-1	7-9	7-6	7-3	7-1
	5'	8-6	8-2	7-9	7-5	7-2	6-11	6-9	6-6	6-4
	6'	7-9	7-5	7-1	6-10	6-6	6-4	6-2	5-11	5-9
	7'	7-2	6-11	6-7	6-3	6-1	5-11	5-8	5-6	5-4
	8'	6-9	6-5	6-2	5-10	5-8	5-6	5-4	5-2	5-0
	9'	6-4	6-0	5-9	5-7	5-4	5-2	5-0	4-10	4-9
	10'	6-0	5-9	5-5	5-3	5-1	4-11	4-9	4-7	4-6
	11'	5-9	5-6	5-2	5-0	4-10	4-8	4-6	4-5	4-3
	12'	5-6	5-3	5-0	4-10	4-8	4-6	4-4	4-3	4-1

MAX AREA OF SLAB SUPPORTED BY ONE POST (sq. ft)

Bearing perpendicular to grain of girt = 400 lb. per sq. in.
Width of girt assumed to be same as width of post.

Thickness of slab, and "w"	4" 125 lb/sq ft	5" 138	6" 150	7" 163	8" 175	9" 188	10" 200	11" 213	12" 225
Size of post									
3×4 (2½"×3½")	33	30	27	25	23	22	20	19	18
4×4 (3½"×3½")	45	41	37	34	32	30	28	26	25
4×6 (3½"×5½")	66	60	55	51	47	44	41	39	37
6×6 (5½"×5½")	97	88	81	74	69	64	60	57	53

SLAB FORMS

MAX. SPAN OF DECKING (inches)

Max. moment = $\frac{1}{10}$ $\frac{12}{12}$ l^2
w = weight of slab per sq. ft. plus 75 lb. per sq ft live load
l = span of decking in inches
Max. fiber stress = 1200 lb. per sq. in.
Max. deflection = $\frac{1}{8}$ in.

Thickness of slab, and "w"	4" 125 lb/sq ft	5" 138	6" 150	7" 163	8" 175	9" 188	10" 200	11" 213	12" 225
Actual thickness of decking									
¾"	26	25	25	24	24	24	23	23	23
⅞"	29	29	28	27	27	26	26	26	25
1"	32	32	31	30	30	29	29	28	28
1⅛"	35	34	34	33	33	32	31	31	30
1¼"	38	37	37	36	35	35	34	33	32
1⅜"	47	46	45	44	43	42	41	41	40

MAX. SPACING OF JOISTS (inches)

Max. moment = $\frac{1}{8}$ w s l^2
l = span of joist in feet
s = spacing in inches
Max fiber stress = 1200 lb. per sq. in.
Max. deflection = $\frac{1}{360}$ l
For joists 3" wide multiply given spacing by 1.5
" " 4" " " " 2.0

Thickness of slab, and "w"		4" 125 lb/sq ft	5" 138	6" 150	7" 163	8" 175	9" 188	10" 200	11" 213	12" 225
Size of joist	Span (ft)									
2×4 (1½"×3½")	4	17	15½	14	13	12	11½	10½	10	9½
	5	11	10	9	8½	8	7	7	6½	6
	6	7½	7	6						
2×6 (1½"×5½")	4	42	38	35	32	30	28	26	25	24
	5	27	25	22½	21	19½	18	17	16	15
	6	19	17	15½	14½	13½	12½	12	11	10½
	7	14	12½	11½	10½	10	9	8½	8	7½
	8	10½	9½	8½	8	7½	7	6½	6	
	9	8½	7½	7	6½	6				
	10	6								
2×8 (1½"×7½")	5	50	46	42	39	36	34	31	30	28
	6	35	32	29	27	25	23	22	20	19
	7	25	23	21	20	18	17	16	15	14
	8	19	18	16½	15	14	13	12	11½	11
	9	15½	14	13	12	11	10½	9½	9	8½
	10	12½	11½	10½	9½	9	8½	8	7½	7
	11	10½	9½	8½	8	7½	7	6½	6	6
	12	8½	8	7½	6½	6				
2×10 (1½"×9½")	6	56	51	47	43	40	37	35	33	31
	7	41	37	34	31	29	27	26	24	23
	8	32	29	26	24	22	21	20	18½	17½
	9	25	23	21	19	18	16½	15½	14½	14
	10	20	18½	17	15½	14½	13½	12½	12	11
	11	16½	15	14	13	12	11	10½	10	9
	12	14½	13	11½	11	10	9½	9	8	8
2×12 (1½"×11½")	7			50	46	43	40	38	35	34
	8	46	42	38	35	33	31	29	27	26
	9	37	33	30	28	26	24	23	21	20
	10	29	27	25	23	21	20	18½	17½	16½
	11	24	22	20	19	17½	16	15½	14½	13½
	12	20	18½	17	16	14½	13½	13	12	11½

UNIVERSAL

Used by the Nation's Construction Engineers

When Ordering Spacers and Chairs note:—

HEIGHTS, lengths, and sizes of Bar Spacers and Chairs are shown on page 42. Slab and Beam Bar Spacers can be ordered in two ways. The structural plans can be sent to us; we will estimate the quantities which we believe are necessary, based on long experience in this work. We will then quote a lump sum price, naming these quantities, and upon receipt of your order, detail the spacers, and mark the plans for their location, and return them to you.

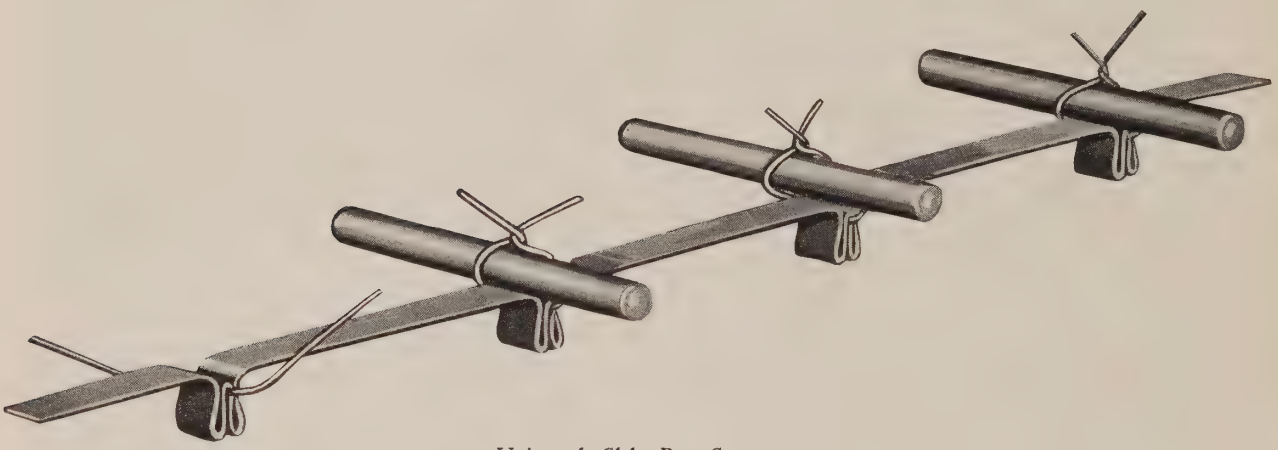
Again, lists can be sent us showing number of bars, spacing, height, etc., and you will be quoted accordingly.

Our standard practice is to furnish the following quantities: For one-way slabs, two strips of Lower Slab Spacer per panel. For two-way slabs, two strips of Lower Slab Bar Spacer per panel, two strips of Upper Bar Spacer for upper layer of bars being furnished only when specified. For two-way flat slab construction, two strips of Lower Slab Bar Spacer for each direct and intermediate band of bars, Upper Spacer for the upper layer of intermediate bars being furnished only when specified. In four-way flat slab construction, two strips of Lower Slab Bar Spacers are furnished for each direct band, and two for the lower layer of diagonal bars; Upper Spacers furnished for upper layers of diagonals when specified. Two joist spacers and two beam spacers per joist, and per beam and lintel, are furnished where clear spans are not over 16 feet. An additional spacer is furnished for each additional 6 feet of clear span over 16 feet. Size of bars in beams should be given.

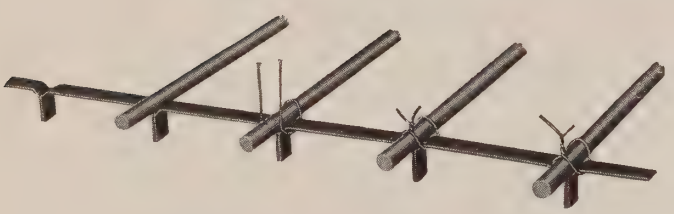
Six to ten High Chairs are necessary around column heads in flat slabs, and two to four for support bars holding up top or bent bars. The number of chairs should be specified.

Bar Chairs, High Chairs, and Joist Spacers can be ordered by quantity, specifying height of chairs for High Chairs, and width, number of bars, and height for Joist Spacers.

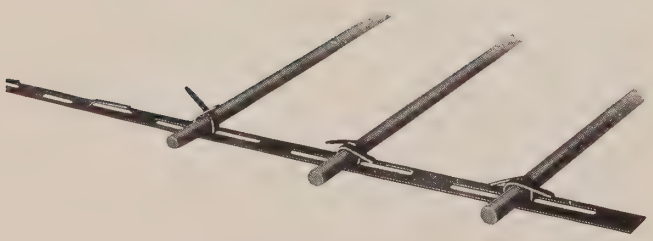
Universal Slab Bar Spacers



Universal Slab Bar Spacer with tie wires.



Universal Slab Bar Spacer without tie wires.



Upper Slab Bar Spacer

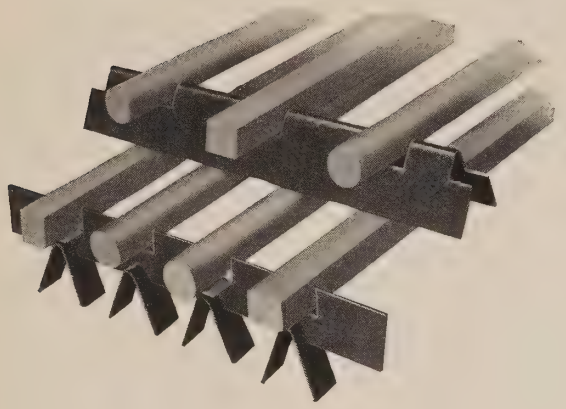
UNIVERSAL SLAB BAR SPACERS with tie wires provide substantial support for slab reinforcement. There is a leg of double folded metal that will stand heavy loads and prevent wedging action under the bars. This spacer is made up in various heights from ½" to 1½" in exact conformation with the specifications of each job, spacing the bars at correct intervals and heights.

Universal Slab Bar Spacers are made without tie wires, as shown. Many contractors and steel setters prefer to use their own tie wire and they will find this spacer satisfactory in every respect. It is fabricated according to design and comes in heights from ½" to 1½". All Universal Bar Spacers are fabricated from the details of each individual plan. They are tagged with designating marks showing exactly in what portion of the building they are to be used. They are shipped in compact bundles that can be handled conveniently.

Universal Upper Slab Bar Spacers space the bars at correct intervals, but do not support them. They are used for bars in the top of the slab and for upper layers of reinforcement in flat slabs wherever accurate spacing is desired.

Heights, weights, etc., are on page 42.

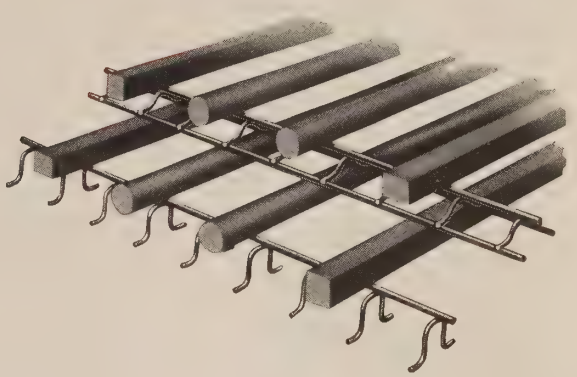
Universal Beam Bar Spacers



UNIVERSAL BEAM BAR SPACERS are designed to properly support and space the bars in each individual beam as to height, width of beam and number of bars per beam. The shelves under the bars in the Style C (lower) Spacer are bent out alternately. This gives stability to the spacer and prevents it from tipping when bars are pulled back and forth in the beams.

Style E (upper) Spacer or Separator provides for the upper layer of bars. It rests on the lower bars and can be placed anywhere on top of them. See heights on page 42.

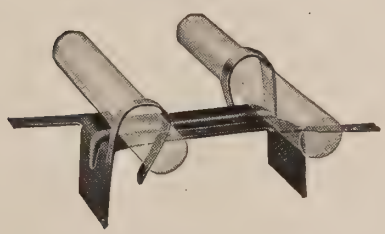
Universal Beam Bolster



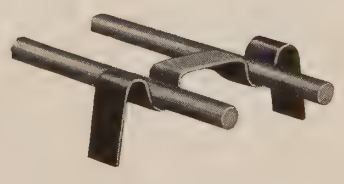
UNIVERSAL BEAM BOLSTER supports the steel in beams and girders, but does not space it laterally. Because there is no definite lateral spacing, this bolster can be shipped from stock to the job and there cut to length. It allows the steel setter the widest latitude in the number and location of supports, and because it contains no definite notches or arms for the bars, can be used in any beam or girder. Universal Beam Bolster can and should be carried in stock by every dealer and jobber handling bar spacers. The upper bolster or separator, like Universal Upper Beam Spacer, is placed anywhere along the top of the lower layer of bars.

Universal Beam Bolsters, both upper and lower, are made in 5-foot lengths and in heights to support the bar from 1½" to 3½" above forms. See heights on page 42.

Universal Joist Bar Spacers



Style B



Style A

UNIVERSAL JOIST BAR SPACERS are furnished in two forms as shown above. These joist bar spacers are adaptable to any type of ribbed floor construction and are made to carry one or two bars. Style A provides a deep groove in which the bars are laid and properly spaced. Style B has metal arms which can be bent back to hold the rod firmly in place. Like all other Universal products, Universal Joist Spacers are designed for strength and simplicity.

Heights and weights, etc., for Beam Spacers, Bolsters and Joist Spacers shown on page 42.

Universal High Chairs

Patented December 21, 1920

UNIVERSAL HIGH CHAIRS give a strong support for the reinforcing bars around column heads and bars in the top of slabs. These chairs nest into each other and are very easily handled. An armful of the chairs can be distributed much more quickly and easily than the cumbersome concrete blocks which were formerly used for supports. There are enough necessary details in the field on a construction job without adding unnecessary ones, which is the case when a contractor uses concrete supporting blocks.

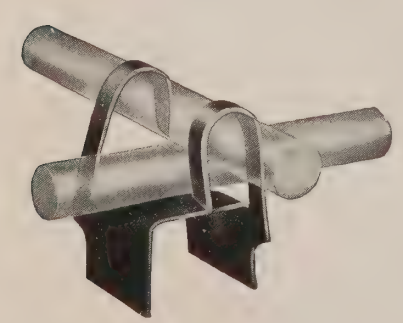
One look at a Universal High Chair will convince you of their strength. For all their stability, they are light in weight and take up little space, insuring the flow of concrete around the reinforcement. The shelves at the bottom are provided with notches for nails, so that when Universal High Chairs are nailed into position they are there to stay. From six to ten chairs are necessary per interior column head. Height is figured from the bottom of chair to underside of support bar. See page 42 for weights of high chairs.

Universal Individual Bar Chairs

Patented February 12, 1918

BARS are quickly placed with Universal Bar Chairs. By bending the arms around the bar, a firm support that will not tip takes the place of a stone or a piece of brick.

Universal Bar Chairs take care of miscellaneous bars on any job. For instance, for bars placed fanwise or in any other irregular manner, for which it is not practical to use continuous spacers. In tunnels and other narrow slabs where the temperature bars are wired to the short slab bars, these bar chairs can be used to great advantage. In fact, there are a great many places on any concrete job where they will save many times their cost.



Universal Bar Chairs can be furnished with nail holes at a slightly additional cost. When so punched, they are widely used to hold reinforcing steel away from the forms in retaining and foundation walls.

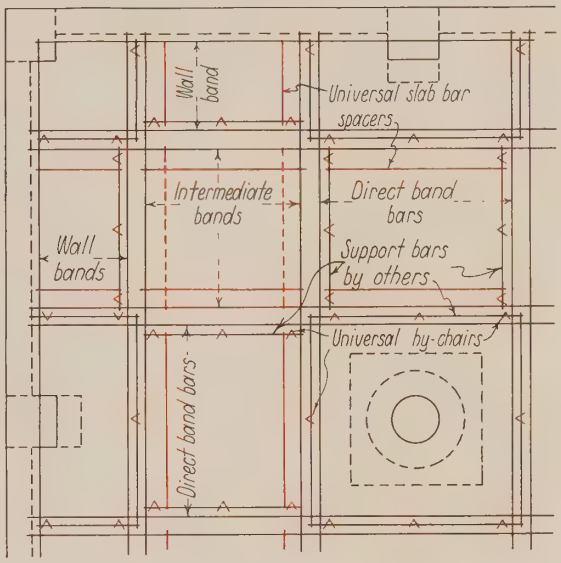
Sizes and heights of High Chairs and Bar Chairs are given on page 42.

Typical Method of Placing Universal Slab Bar Spacers and High Chairs for Slab Bars in Bands in Two-Way Flat Slab Construction.

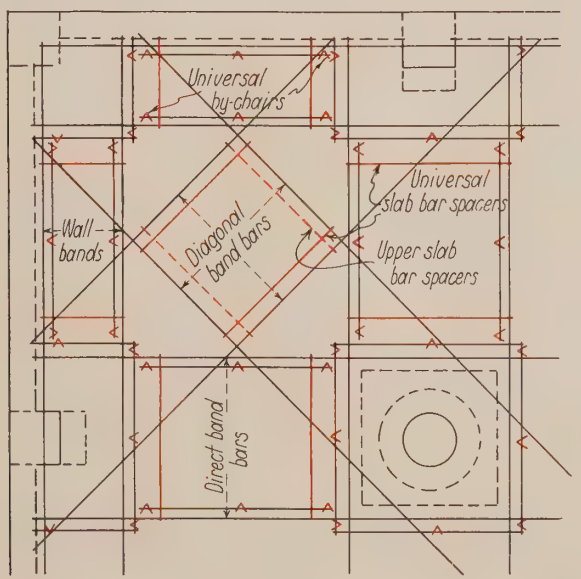
Use two strips of Universal Lower Slab Bar Spacer in each direct and intermediate band of bars, except in unusually large panels, where three should be placed.

Use two strips of Universal Upper Slab Bar Spacer for upper layer of bars in intermediate bands, when accurate spacing is desired. These bars are already supported by the bars below.

Use three Universal High Chairs per support bar.



Typical Method of Placing Universal Slab Bar Spacers and High Chairs for Slab Bars in Bands in Four-Way Flat Slab Construction.



Use two strips of Universal Lower Slab Bar Spacer in each direct and diagonal band of bars, except in unusually large panels, where three should be placed.

Use two strips of Universal Upper Slab Bar Spacer for upper layer of bars in diagonal bands when accurate spacing is desired. These bars are already supported by bars below.

Use three Universal High Chairs per support bar.

Data on Spacers and Bar Chairs

Slab Bar Spacers

Lower Slab Bar Spacers are made to give a clearance between the bottom of the steel and the form of ½", ¾", 1", 1¼" and 1½". The first three heights are standard, an extra charge being made for the 1¼" and 1½" heights.

The minimum spacing of bars for standard heights is 2"; for special heights 4". The length of strip is limited to about 20', due to the difficulty in handling and shipping longer strips.

Upper Slab Bar Spacer

The minimum spacing on Upper Spacer is 4". The maximum length is the same as for the Lower Slab Spacer.

Beam Bar Spacers

Beam Bar Spacers, Type C, for lower or single layer of bars in beams. are made in two standard heights, to give 1½" and 2" clear between the bottom of the steel and the form. Special heights up to 3" can be furnished at an additional cost. The above also applies to Type E, except that standard distance between layers of bars is 1".

Wire Beam Bolster

The Universal Wire Beam Bolster is furnished in 5-foot lengths, 100 feet to the bundle. The standard heights of the lower type bolster are 1½" and 2"; of the upper bolster, 1". It can be supplied in 1" heights and also up to 3½" in height. The 1½" and 2" high lower bolster and 1" upper bolster are shipped from stock. Special heights are shipped within one week from receipt of order.

Joist Bar Spacers

Joist Bar Spacers are made in the following widths and heights, the latter being from bottom of steel to form:

Style	Width	Height	No. of Bars
A	6"	1½", 1", ¾"	2
A	5"	1½", 1", ¾"	2
A	4"	1" and ¾"	1 and 2
B	6"	1" and ¾"	2
B	5"	1", ¾", ½"	2
B	4"	1", ¾", ½"	1 and 2

We recommend Style A Spacers for general use.

Bar Chairs

Individual Bar Chairs are stocked as follows:

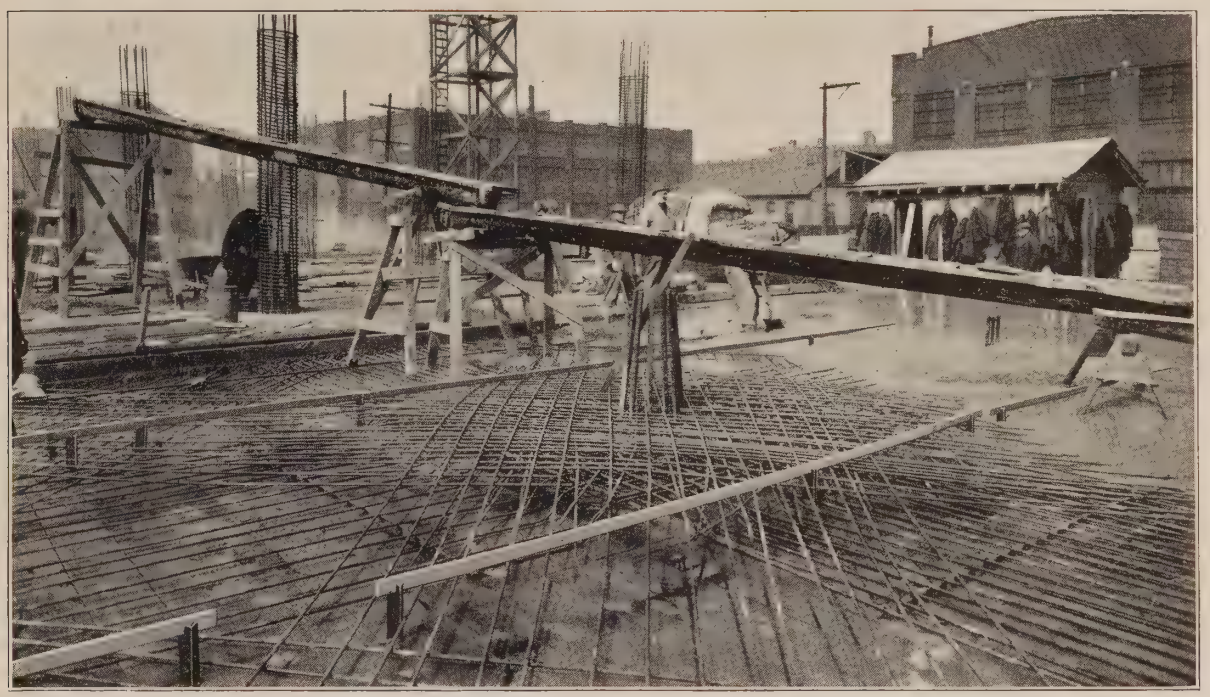
No.	Height	Take Bar
2	¾"	1 "
3	1 "	1½"
3	1½"	1½"
3	2 "	1½"

High Chairs and Screed Chairs can be furnished in any height.

Weights of Bar Spacers and Chairs

Lower Slab Bar Spacers—1" high	Weight per 1000 feet	210	Lbs.
Upper Slab Bar Spacers	" " " "	150	"
Beam Bar Spacers, Style C—1½" high	" " " "	500	"
Beam Bar Spacers, Style E—1" high	" " " "	650	"
Beam Bolsters—1½" high	" " " "	350	"
Joist Bar Spacers, Style A—6" wide, 1" high	Weight per 1000 pieces	195	"
Joist Bar Spacers, Style A—5" high	" " " "	165	"
Joist Bar Spacers, Style A—4" high	" " " "	135	"
Joist Bar Spacers, Style B—5" high	" " " "	100	"
Joist Bar Spacers, Style B—4" high	" " " "	85	"
Bar Chairs— ¾" high	" " " "	60	"
Bar Chairs—1½" high	" " " "	85	"
Bar Chairs—2 " high	" " " "	100	"
High Chairs—6" high	" " " "	380	"
Screed Chairs—6" high	" " " "	390	"

Extra charges made for crating Slab Bar Spacers for express shipment.



Universal Screed Chairs

Patented December 21, 1920

UNIVERSAL SCREED CHAIRS are made on the same general principle as Universal High Chairs, but have two notches in the top of the chair for supporting the screed bar. This chair is light and strong, easily and quickly placed. It is nailed to the form by means of a notch in the shelves at the base of the chair and is held firmly in place while the concrete is being poured. For the screed, a metal bar 5/16″x1½″ or 2″ is used in the top notches provided for it. Because of the deep section of the screed bar, few chairs are needed for a rigid support without deflection. Three chairs are sufficient for a 14-foot bar.

After the screed is no longer required, the bar can be easily lifted from the chair, leaving practically no depression in the slab, which is not the case when a thick wooden screed is used. Screed bars can be used over and over while the chairs remain in the slab. A trial of these screed chairs will prove their economy and efficiency.

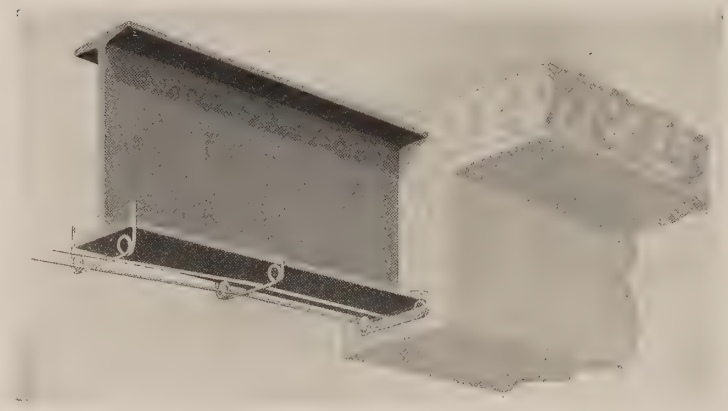
In ordering, give height of chair as distance from bottom of screed bar to bottom of chair.

Sizes and weights of Screed Chairs are given on page 42.

Reed Soffit Clips

For Steel Beams, Girders and Columns and Absolute Insurance Against Defective Soffits.

WHERE structural steel members are to be fireproofed with concrete, good practice demands that they be provided with some form of clip which will prevent failure of concrete along the lower flanges of such members. Reed Clips, in the most simple and scientific manner, insure against failure. The cross members are offset 1″ by loops, thereby furnishing a bond sufficient to thoroughly reinforce the concrete. One or more longitudinal wires hold the cross-wires in place by welds. The cross-wires do not project beyond the flange and, therefore, offer no obstruction in the pouring of concrete, nor can they be dislodged by ramming and tamping.



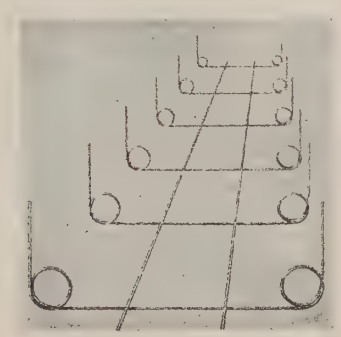
Reed Clips are offset, absolutely preventing failure.

Reed Clips are strongly made of No. 12 gauge wire electrically welded. They are light in weight, easily shipped and stored, and most easily applied. They permit the worker to keep his work ahead of him the entire length of the steel member. The mechanic never leaves his position for any one beam, girder or column. He simply bends each clip over the flange and shoves the fabric ahead the required distance.

Reed Clips come in 5 ft. lengths with clipping members spaced 12″ apart. One or more longitudinal wires are used, depending on the width as follows:

Flange Width	Space of Clips	No. of Longitudinals
3″ to 8″	12″	1
9″ to 15″	12″	2
16″ to 20″	12″	3
21″ to 26″	12″	4

The above may be altered at slight expense to meet special requirements. Reed Clips are shipped in bundles of 5 ft. lengths and 250 ft. per bundle. When shipped by freight or express, they are well crated.



Reed Clip with two longitudinal members.

To Order Reed Clips

The following table gives the width of Clip required for standard I-beams of various sizes:

Size of I-Beam	Weight	Width of Clip
3″	Any	3″
4″	"	3″
5″	"	3″
6″	"	3″
7″	"	4″
8″	"	4″
9″	21-25 Lbs.	4″
9″	30-35 Lbs.	5″
10″	Any	5″
12″	"	5″
15″	"	6″
18″	55-70 Lbs.	6″
18″	75-90 Lbs.	7″
20″	65-81 Lbs.	6″
20″	85-100 Lbs.	7″
24″	79-100 Lbs.	7″
24″	105-120 Lbs.	8″

To order clips for Bethlehem sections and trusses, girders or columns, state the size and weight and type of section, or the width of the flange. For channels state size of section.

Universal Continuous Sleeper Anchors

Patents Pending

Five anchors are inserted with one operation. When the concrete has set, simply turn up the arm of the anchor and nail the sleeper in place.

SLEEPER ANCHORS, if properly designed, fasten nailing strips to the top surface of concrete slabs. They are inserted while the concrete is soft, and provide a strong and permanent anchorage for sleepers after the concrete is set.

The Universal Form Clamp Co. offers a choice of two styles of Continuous Sleeper Anchors. Five or six individual anchors are firmly welded to a connecting wire or wires, so that with one operation, requiring little longer than the setting of a single anchor, five or six anchors are inserted, properly spaced. Instead of moving a template plank five times for five rows of anchors, it is moved once.

Sleeper Anchor Style "P" (parallel) lies parallel to the sleeper as illustrated above. The V-shaped anchors are of No. 10 wire and form an extremely strong anchorage. There are two No. 12 gauge wires connecting the anchors. After the concrete is set, the sleeper is placed along and on top of the anchor, and wire arms with loops are bent up on both sides for nailing.

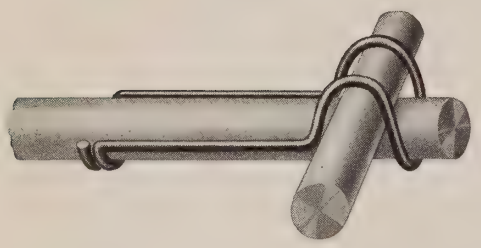
Sleeper Anchors Style "R" (right angle) are placed at right angles to the sleeper and have one No. 7 connecting wire. Its arms also lie flat and are bent up for nailing to the sleeper. The hooks on the anchors allow easy penetration in the wet concrete and form an unusually strong anchor.

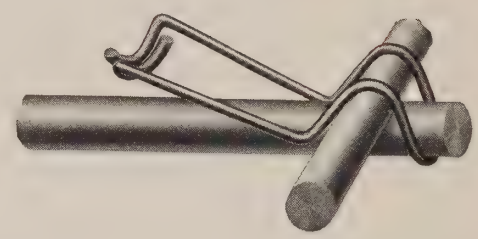
The connecting wires on both sleepers act as a float and prevent the anchors from settling too deep in the wet concrete.

Style "P" and "R" Sleeper Anchors are carried in stock for 2″ and 3¾″ sleepers with anchors spaced 12″ or 16″ on center. The Style "P" comes in lengths of approximately 5′; the Style "R" in 4′ lengths. Special lengths and spacings in either type can be obtained.

Universal Plain Bar Ties

Patented May 30, 1916





THESE Universal Plain Bar Ties are instantly snapped into place on the reinforcing bars, giving a quicker, better and more economical method of tying.

These ties are applied at one-fourth the labor cost of the ordinary method of tying, and they are infinitely better. A green man, one of your day laborers, can tie together twenty intersecting bars per minute from the start.

The ties are suitable for tying together the following combinations of intersecting bars, whether round, square, square twisted or deformed, or any combination of one style with another. If bars are square or square twisted, figure combined diameter ¼ inch more than the actual size.

Size No. 0—For tying two intersecting bars, as follows: ¼x¼, ¼x⅜, ⅜x⅜ inches.

Size No. 1—For tying two intersecting bars, the combined diameter of which is not greater than 1 inch, as follows: ⅜x¼, ⅜x⅜, ½x¼, ½x⅜, ½x½ inches.

Size No. 2—For tying two intersecting bars, the combined diameter of which is not less than 1 inch nor greater than 1⅜ inches, as follows: ½x½, ⅝x⅜, ⅝x½, ⅝x⅝, ¾x¼, ¾x⅜, ¾x½, ¾x⅝ inches.

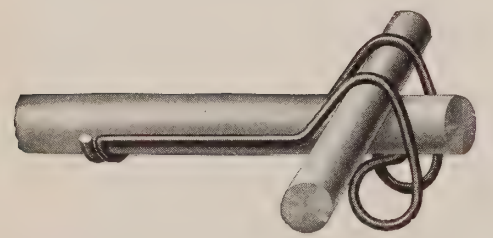
Size No. 3—For tying two intersecting bars, the combined diameter of which is not less than 1¼ inches nor more than 1⅝ inches, as follows: ¾x½, ¾x⅝, ¾x¾, ⅞x⅜, ⅞x½, ⅞x⅝, ⅞x¾, 1x⅜, 1x½, 1x⅝ inches.

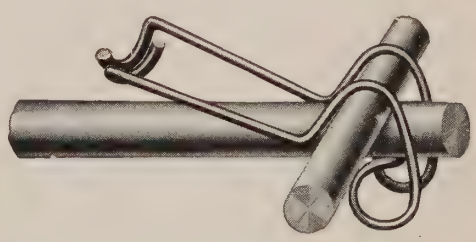
Let us send you by parcel post and without obligation, enough samples for a practical try-out. (In ordering, state size required.)

No. 0 Ties are packed in cartons of 2,000, No. 1 and No. 2 in cartons of 1,000 and No. 3 Ties in cartons of 750. No broken lots will be forwarded.

Universal Tie Chair

Patented January 30, 1917





UNIVERSAL TIE CHAIRS are made of high carbon spring wire, so constructed that they tie the bars and space them from the forms as well. This Universal Tie Chair enables you, without additional cost, to observe order and system in the placing and tying of reinforcements. Only two sizes required for fourteen different combinations and sizes of bars.

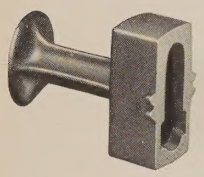
Size No. 1—For tying and supporting any two intersecting bars, the combined diameter of which is not greater than 1 inch, as follows: ½x¼, ½x⅜, ½x½, ⅝x¼, ⅝x⅜, ¾x¼ inches.

Size No. 2—For tying and supporting any two intersecting bars, the combined diameter of which is not less than 1⅛ inch nor more than 1⅜ inches, as follows: ⅝x½, ⅝x⅝, ¾x⅜, ¾x½, ¾x⅝, ⅞x⅜, ⅞x½, 1x⅜ inches.

These Tie Chairs are packed in cartons of 500. No broken lots will be shipped.

Universal Inserts

UNIVERSAL PRESSED STEEL AND MALLEABLE INSERTS are used wherever inserts are required for shaft hangers, sprinkler systems, plumbing and heating systems, etc. The use of inserts placed into concrete construction saves time and labor, and eliminates delays in making the building ready for occupancy. There is a style and size of Universal Insert for every requirement.



Universal Malleable Inserts (Adjustable)

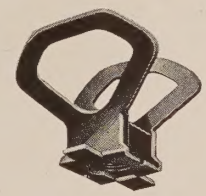
Universal Malleable Inserts are made of the highest grade of malleable castings. The bolt is adjustable the full length of the slot, because of the design and position of the notch through which the nut or bolt-head is inserted. Notches on both sides of the casting provide for nailing to the form. They are made for bolts from 3/8" to 7/8" in diameter.

Universal Pressed Steel Inserts

Adjustable

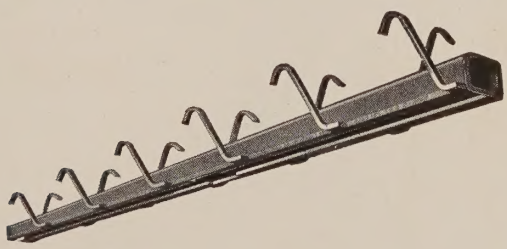
The picture to the left and right respectively are Universal Adjustable and Universal Tapped Inserts. These two types of inserts are manufactured from the best grade of openhearth steel. The adjustable inserts are made for 1/2", 5/8" and 3/4" bolts, and a special washer can be furnished with a 1/2" insert to carry a 3/8" bolt. Universal Tapped Inserts are tapped for 3/8", 1/2", 5/8" and 3/4" bolts.

Tapped inserts should be used only when the exact location of the equipment to be supported can be determined before the start of construction.



Tapped

Universal Slotted Inserts (Pressed Steel)

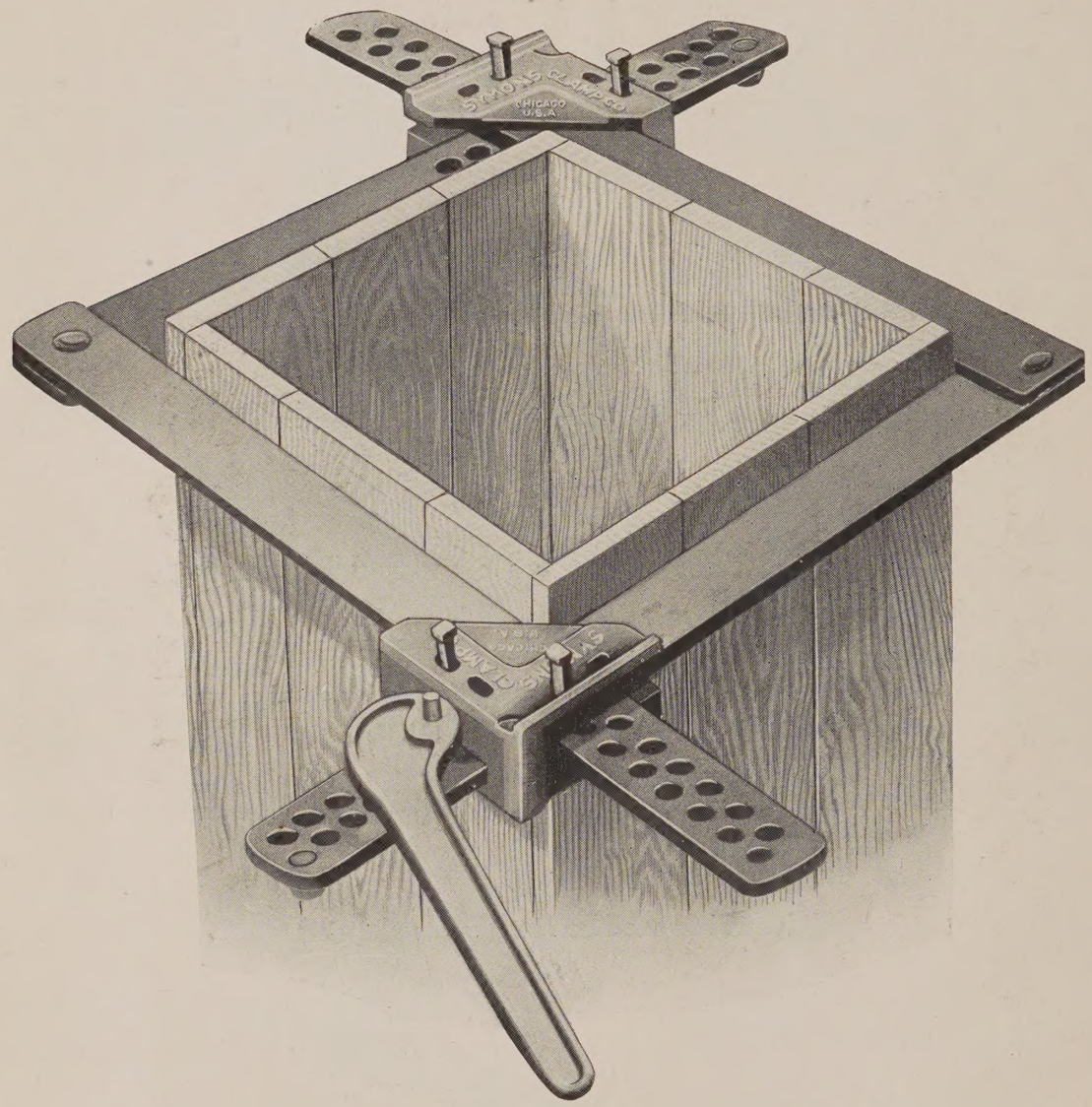


These Inserts give the utmost flexibility and provide a means of suspension for any emergency. They can be placed into and across the entire ceiling as a permanent means of anchorage. The cost of installation is low, being no more than 2 cents per foot, and this, together with the low original cost, makes them a real economy.

Universal Slotted Inserts are made for use with 1/2", 5/8" and 3/4" bolts. The standard lengths of inserts are 12", 18", 24", 36", 48" and 60".

Symons Column Clamps

Patented August 20, 1912, and November 16, 1916.



THE SYMONS COLUMN CLAMP consists of two pairs of pivoted arms with a malleable bracket which slides on one side of the arms and gives instant and accurate adjustment on the clamp. It has great strength, holding the column form tightly in line. With these clamps, the only carpenter work necessary on column forms is the cleat which holds the boards together. This cleat is necessary no matter what kind of clamp is used.

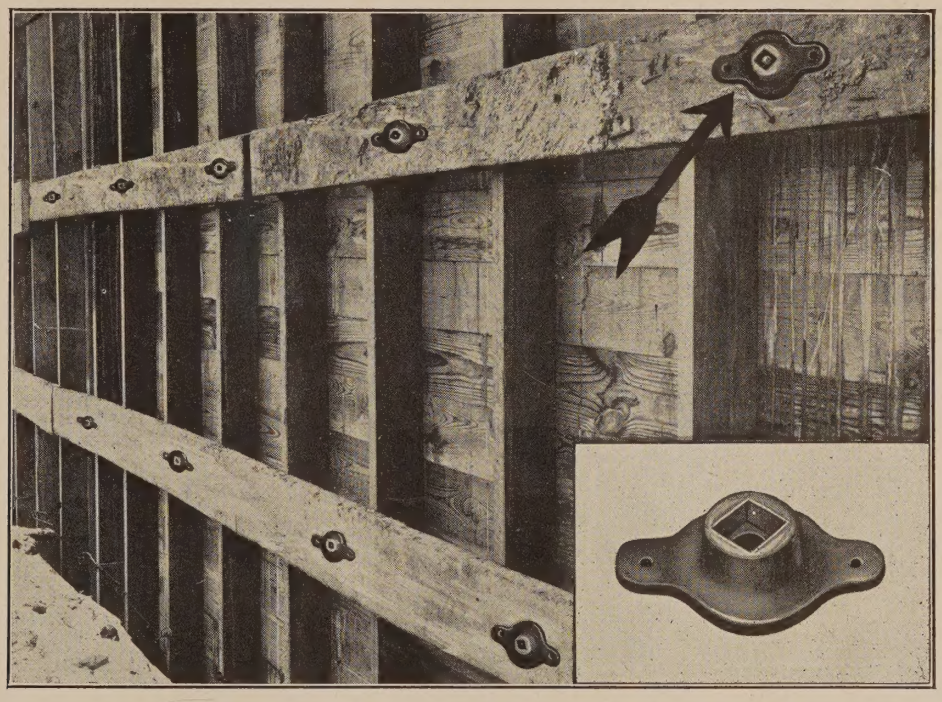
Symons Column Clamps can be rented with a 90-day purchase option, the rentals applying on the purchase price. They are shipped to any place in the United States subject to thirty days' trial and approval, putting you under no obligation whatever. If, at the end of thirty days, they do not prove satisfactory, they may be returned, freight collect. Sizes are shown on page 25.

THE
BENDIXEN ROD RELEASE

PATENT APPLIED FOR

A little CASTING with a BIG result. Reduces bracing costs on concrete wall forms which are inaccessible after completion. For use wherever forms are placed against rock formations, in restricted excavations, or along side of buildings.

CONTRACTORS! YOU CAN NO LONGER AFFORD TO USE HEAVY TIMBERS WHEN YOU ARE **IN A HOLE** OR **UP AGAINST IT.** The little rod release permits the use of your regular rods, nuts and clamps. It transforms heavy, slow labor into light, quick jobs.



When constructing forms, nail the Release to the outer wales. Pass tie rod thru its central hole and apply nut drawing well into socket. Fasten inner end of rod preferably by a Universal Form Clamp.

When dismantling forms, remove clamp, unscrew rod from nut by means of a Stillson wrench **applied to the inner end.** The nut can't turn. Then take out rod in the usual manner with a Universal Rod Puller.

Isn't it a simple trick! Figure your bracing costs by ancient methods and obtain further particulars at once from

GEO. BENDIXEN
51 EAST 42ND STREET
NEW YORK

Phone Vanderbilt 5462

N. Y.

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